USDA
United States Department of Agriculture

Goose Project

Final Environmental Impact Statement

Legal Location: T16S R5E: 1-4, 9-15; T16S R6E Sec: 7-11, 14-18, 20-23
Willamette Meridian; Lane County, Oregon

WILLAMETTE NATIONAL FOREST

August
2015

Final Environmental Impact Statement
Goose Project
Willamette National Forest
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Website: http://www.fs.usda.gov/project/?project=45853

Abstract: This final Environmental Impact Statement (FEIS) contains the Willamette National Forest's proposal to provide a sustainable supply of timber products, reduce hazardous fuels in the McKenzie Bridge Wildland-Urban Interface (WUI), and actively manage stands to improve stand conditions, diversity, density and structure in 2,452 acres on the Willamette National Forest. The proposed project is located along Highways 126 and 242, near the community of McKenzie Bridge, Oregon. Three alternatives have been analyzed in this FEIS, a no action alternative (Alternative 1) and two action alternatives (Alternative 2 and Alternative 3). Alternative 2 proposes 2,452 acres of treatment; 1,592 acres of timber harvest, 502 acres of skips, and 358 acres of WUI fuels treatment. In Alternative 3 the Forest Service proposes 1,069 acres of treatment; 610 acres of timber harvest, 134 acres of skips, and 325 acres of WUI fuels treatment. Alternative 2 is the Forest Service proposed action and preferred alternative.

Reader’s Guide

The McKenzie River Ranger District has prepared this final Environmental Impact Statement (FEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This FEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized as outlined below:

- *Summary*
- *Chapter 1. Purpose and Need:* This chapter describes the scope and objectives of the proposal as well as defines why the proposal is being made at this location and at this time.
- *Chapter 2. Alternatives Including the Proposed Action*: This section describes the proposed action as well as alternative methods for achieving the project’s purpose. Alternatives are designed to meet the project’s purpose and need and to address one or more significant issues related to the proposed action. This chapter also includes mitigation measures and a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences:* This chapter describes the environment that would be affected by the proposed action as well as the environmental consequences of implementing the proposed action and other alternatives. The analysis is organized by resource area.
- *Chapter 4. List of Preparers:* This section lists the names, together with their qualifications (expertise, experience, professional disciplines), of the persons who were primarily responsible for preparing the environmental impact statement.
- *Chapter 5. List of Agencies, Organizations, and persons to whom copies of the statement are sent*
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the draft environmental impact statement.
- *References*
- *Glossary*
- *Index*

Additional documentation, including more detailed analysis of project area resources, can be found in the project planning record located at the McKenzie River Ranger District Office on the Willamette National Forest.

List of Acronyms

ACS..................Aquatic Conservation Strategy
AMA ....Adaptive Management Area
ARP..................Aggregate Recovery Percentage
B/C Ratio ....Benefit / Cost Ratio
BE ....Biological Evaluation
BLM.................Bureau Of land Management
BMP.................Best Management Practices
BO....................Biological Opinion
C:N...................Carbon:Nitrogen ratio
CFR..................Code of Federal Regulations
CH....................Critical Habitat
CWPP...............Community Wildland Protection Plan
DBH.................Diameter Breast Height (4.5 feet above ground)
DEIS.................Draft Environmental Impact Statement
DEQ ....Department of Environmental Quality
DNA.................Deoxyribose Nucleic Acid
DTR ....Dominant Tree Release
EFH..................Essential Fish Habitat
EIS ....Environmental Impact Statement
ESA..................Endangered Species Act
FEIS ....Final Environmental Impact Statement
FL.....................Flame Length
FM....................Fuel Model
FR.....................Fire Regime
FRCC ....Fire Regime Condition Class
FS.....................Forest Service
FSH..................Forest Service Handbook
FSM ....Forest Service Manual
FSVeg...............Forest Service Vegetation database
FVS..................Forest Vegetation Simulation
GIS...................Geographic Information System
GPS..................Global Positioning System
HE....................Habitat Effectiveness
HH....................Harvest Habitat
HUC.................Hydrologic Unit Code
IRA...................Inventoried Roadless Area

LAA ....Likely to Adversely Affect
LMRP...............Land and Resource Management Plan
LSR ....Late Successional Reserve
LWM................Large Woody Material
MA...................Management Allocation
MBF.................Thousand Board Feet
MIS ....Management Indicator Species
MMBF ....Million Board Feet
MNRT ....McKenzie National Recreation Trail
MSA.................Magnuson-Stevens Fishery Conservation and Management Act
MSNO..............Master Site Number
MVUM.............Motor Vehicle Use Map
NEPA ....National Environmental Policy Act
NFF ....National Forest Fund
NHPA...............National Historic Preservation Act
NLAA ....Not Likely to Adversely Affect
NMFS...............National Marine Fisheries Service
NOAA..............National Oceanic and Atmospheric Administration
NPV ....Net Present Value
NRHP...............National Register of Historic Places
NRIS ....Natural Resource Information System
NRT..................National Recreation Trail
NSO ....Northern Spotted Owl
NWFP ....Northwest Forest Plan
ODF ....Oregon Department of Forestry
OFRI ....Oregon Forest Resources Institute
OHV.................Off-Highway Vehicle
PETS ....Proposed Endangered Threatened and Sensitive species
PFMC...............Pacific Fishery Management Council
PNW.................Pacific Northwest
PWA.................Potential Wilderness Area
Q100.................100 Year Flood Flows
RA32................Recovery Action 32
ROD.................Record of Decision
ROS ....Rate Of Spread (Fire and Fuels)
ROS..................Recreation Opportunity Spectrum
SDI...................Stand Density Index

SDImax............Maximum Stand Density Index
SIA...................Special Interest Area
SMS ....Scenery Management System
TL.....................Tolerance Level
TMDL ....Total Maximum Daily Load
UMR ....Upper McKenzie River
USDA...............United States Department of Agriculture
USFWS............United States Fish and Wildlife Service
VMS.................Visual Management System
VQO.................Visual Quality Standard
WCS.................West Cascades South
WEPP...............Watershed Erosion Prediction Project model
WMU...............Wildlife Management Unit
WUI ....Wildland-Urban Interface

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Table of Contents

List of Tables

List of Figures

Summary

The McKenzie River Ranger District is proposing to provide a sustainable supply of timber products, reduce hazardous fuels in the McKenzie Bridge Wildland-Urban Interface (WUI), and actively manage stands to improve stand conditions, diversity, density and structure in 2,452 acres on the Willamette National Forest. The proposed project is located along Highways 126 and 242, near the community of McKenzie Bridge, Oregon.

Purpose and Need

Provide a Sustainable Supply of Timber Products

The proposed project is needed to ensure the Willamette National Forest continues to supply a reliable supply of timber products as directed by the laws and guidance discussed in Section 1.3.1 and in doing so contributes to the stability of local, regional, and national economies and achieves the annual Probable Sale Quantity (PSQ) target for the Forest.

Reduce Hazardous Fuels in the McKenzie Bridge Wildland-Urban Interface (WUI)

Fire suppression over the past century has resulted in increased fuel loading throughout forest ecosystems. This increased fuel loading consists of surface fuels, ladder fuels (small trees and brush that can carry fire into larger tree crowns), and dense overstory canopies. The proposed project is needed to treat hazardous fuels in the McKenzie Bridge WUI to reduce potential wildfire impacts and risks to the many private dwellings and residents in the project area.

Actively Manage Stands to Improve Stand Conditions, Diversity, Density and Structure

The proposed project is needed to improve stand conditions, diversity, density, and structure in the project area, providing benefits to vegetation, wildlife, and overall health of the forest. This would be achieved by increasing stand health and vigor, increasing the amount of early seral habitat, and increasing the potential for Riparian Reserves to function as late successional habitat.

Increase Stand Health and Vigor: Seventy-four percent of previously managed stands and fire regenerated stands proposed for harvest in the project area are classified as overstocked. Overstocked stands occur when trees are closely or densely spaced, resulting in a competition for resources. Closely spaced trees competing for resources generally result in decreased individual tree growth. Overstocked stands can also cause increased tree/stand stress, resulting in increased susceptibility to insect and disease outbreaks. Additionally, overstocked stands can increase the potential for high severity wildfires.

Thinning the overstocked stands would make more growing space and resources available to the remaining trees, resulting in decreased tree stress and development towards larger diameter stands. Stand vigor would also be increased as released trees develop into larger trees sooner, accelerating the development of some late successional characteristics. Tree species, age, and structure diversity would be maintained or enhanced.

Increase the Amount of Early Seral Habitat: A reduction in low severity and stand-replacing fires on the landscape over the past century, coupled with in-growth of openings created from historic timber harvesting and stand replacing fires, has resulted in a reduced amount of early seral habitat in the project area. Currently, there is less than one percent early seral habitat (defined as less than 20 years old) in the project area. There is a need to enhance, create, and maintain early seral habitat to support wildlife species that have been documented to depend on early seral habitat, such as elk, black-tailed deer, rufous hummingbirds, olive-sided flycatchers, and a large number of butterfly and moth species. The proposed project would increase early seral habitat in the project area to approximately three percent.

Increase the Potential for Riparian Reserves to Function as Late Successional Habitat: Portions of Riparian Reserves within project units consist of dense, overstocked, conifer-dominant stands with very little structural and species diversity and understory development. This lack of complexity and diversity is outside the natural range of variability and may be limiting nutrient cycling, deciduous organic matter input to waterbodies, and habitat for riparian-dependent wildlife. The proposed project is needed to maintain conditions in currently functioning portions of Riparian Reserves and in overstocked, conifer-dominant portions lacking structural and species diversity, use silvicultural tools to acquire desired vegetation characteristics needed to more quickly attain Aquatic Conservation Strategy Objectives (Appendix E). Management of these stands would accelerate the ability of Riparian Reserves to provide important habitat for riparian-dependent wildlife and organic matter input, nutrient cycling, and large diameter wood to waterbodies and floodplains, while maintaining adequate stream shade, root strength and bank stability, and sediment filtration.

Alternatives

Three alternatives were analyzed in this FEIS; a no action alternative (Alternative 1) and two action alternatives (Alternative 2 and 3). The alternatives vary by the amount of treatment and the specific prescriptions to be implemented (Table 1). Alternative 2 is the proposed action and preferred alternative.

Table 1. Comparison of the Alternatives

	Alternative 1	Alternative 2	Alternative 3
Timber Harvest Treatments			
Acres of Thinning outside Riparian Reserves	0	1,080	412
Acres of Thinning in Riparian Reserves	0	138	57
Acres of Regeneration Harvest	0	43	0
Acres of Gaps	0	281	111
Acres of Dominant Tree Release	0	50	30
Acres of Skips outside Riparian Reserves	0	173	45
Acres of Skips In Riparian Reserves	0	291	89
Total Acres of Timber Harvest Units (includes skips)	**0**	**2,056**	**744**
Timber Volume Produced (million board feet or MMBF)	**0**	**~35**	**~9**
WUI Fuels Treatments- No Timber Harvest			

	Alternative 1	Alternative 2	Alternative 3
Acres of Natural Fuels Underburn outside Riparian Reserves	0	33	0
Acres of Natural Fuels Underburn within Riparian Reserves	0	0	0
Acres of Hazardous Fuels Treatments outside Riparian Reserves	0	189	189
Acres of Hazardous Fuels Treatments within Riparian Reserves	0	136	136
Acres of Skips (associated with WUI treatments)	0	38	0
Total Acres of WUI Treatments	**0**	**396**	**325**
Total Acres of Treated Units; Timber Harvest and WUI	**0**	**2,452**	**1,069**
Post-Harvest Fuels Treatments[1] in Timber Harvest Units			
Acres of Pile and Burn (mechanical and/ or hand treatments)	0	624	309
Acres of Post-Harvest Underburn	0	477	178
Road Activities Associated with Harvest			
Miles of Temporary Road Construction	0	6.9	2.2
Miles of Roads Maintained	0	43	26
Acres by Harvest System			
Helicopter Harvest	0	215	0
Skyline Harvest	0	582	112
Ground-based Harvest	0	795	498
Harvest Associated Planting, Snags, and Down Wood			
Acres of Planting in Regeneration Harvest	0	43	0
Acres of Planting in Gaps	0	77	48
Acres of Natural Regeneration in Gaps	0	204	63
Snags and Down Wood (occurs in regeneration units)	0	Retain or create up to 5 snags per acre and at least 240 linear feet of down wood on approximately 43 acres.	0

	Alternative 1	Alternative 2	Alternative 3
Northern Spotted Owl (NSO) Habitat			
Acres[2] of NSO Critical Habitat in Harvest Units (footprint acres including skips)	0	505	63
Acres[3] of Suitable NSO Habitat in Harvest Units (footprint acres including skips)	0	445	0
Acres of NSO Dispersal Habitat in Harvest Units (footprint acres including skips)	0	1,508	660
Acres of NSO Non-Habitat in Harvest Units (footprint acres including skips)	0	103	85
Acres of Prescribed Underburn in NSO Habitat	0	60- suitable habitat	0
Acres of Hazardous Fuels Reduction in NSO Habitat	0	295- suitable habitat 6- dispersal habitat	295- suitable habitat 6- dispersal habitat

[1]: Post-harvest fuels treatments methods may change depending on feasibility and funding. Post-harvest fuels treatments would occur in timber harvest units; therefore the acreage of post-harvest fuels treatments are not included in the total acres of treated units.

[2]: The above acres in NSO Critical Habitat have been reduced from those which were consulted on because units have been dropped or modified.

[3]: Two acres of spotted owl suitable habitat removal stated for Alternative 2 are for road building and a helicopter landing pad; the trees within these two acres would be felled and left on-site.

Summary of Environmental Consequences

Table 2. Summary of Direct Effects on Resources for Alternative 2 and Alternative 3

Resource	Alternative 1	Alternative 2	Alternative 3
Forest and Stand Structure	Growth rates would continue to decline, and natural processes that affect tree vigor and cause changes in stand structure would continue. The effects of overstocked stands include decreased growth, increased rates of mortality, higher risk for insect and disease attacks, and higher risk for stand replacing fires. High stocking density and canopy covers would continue to restrict regeneration of shade intolerant species such as Douglas-fir and sugar pine. The product value of trees harvested in the future would be reduced due to continued decline in diameter growth.	1,599 acres treated to reduce competition, increase growth rates and tree vigor, reduce mortality and risk of insect and disease attacks, and lower risk for stand replacing fires. Reduced densities would increase opportunities for regeneration of shade intolerant species such as Douglas-fir and sugar pine. The product value of trees in the future would increase with increased diameter growth.	609 acres treated to reduce competition, increase growth rates and tree vigor, reduce mortality and risk of insect and disease attacks, and lower risk for stand replacing fires. Reduced densities would increase opportunities for regeneration of shade intolerant species such as Douglas-fir and sugar pine. The product value of trees in the future would increase with increased diameter growth.

Resource	Alternative 1	Alternative 2	Alternative 3
Fire and Fuels	No effect	Hazardous fuels in WUI would be reduced. Timber harvest slash would follow Forest Plan standard and guidelines FW-212 and FW-252 guidance. Returning fire would increase stand diversity and structure.	Hazardous fuels in WUI would be reduced. Timber harvest slash would follow Forest Plan standards and guidelines FW-212 and FW-252 guidance. Returning fire would increase stand diversity and structure.
Soil Productivity	No effect	Nutrient availability and compaction would remain within the limits outlined in the standard and guidelines of the forest plan.	Nutrient availability and compaction would remain within the limits outlined in the standard and guidelines of the forest plan.
Water Quality and Quantity	No effect	Water quality would be protected. Treatment of riparian vegetation would meet TMDL requirements for temperature and sediment. No increased flood flows are anticipated due to this project	Water quality would be protected. Treatment of riparian vegetation would meet TMDL requirements for temperature and sediment. No increased flood flows are anticipated due to this project
Upper Willamette River Chinook Salmon (Evolutionarily Significant Unit-ESU)	No effect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Upper Willamette River Chinook Salmon (Critical Habitat)	No effect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Upper Willamette River Chinook Salmon (Essential Habitat)	No effect	Will not adversely affect	Will not adversely affect
Columbia River Bull Trout (Distinct Population Segment-DPS)	No effect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Columbia River Bull Trout (Critical Habitat)	No effect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Rainbow Trout (Management Indicator Species)	No effect	Beneficial effect	Beneficial effect
Coastal Cutthroat Trout (Management Indicator Species)	No effect	Beneficial effect	Beneficial effect

Resource	Alternative 1	Alternative 2	Alternative 3
Caddisflies - *Rhyacophila chandleri, Rhyacophila leechi, Namamyia plutonis* (R6 Sensitive)	No effect	Beneficial effect	Beneficial effect
Northern Spotted Owl (ESA Threatened and Management Indicator Species)	No effect	Likely to adversely affect due to suitable habitat removal and noise disturbance; not likely to adversely affect due to removal of dispersal habitat.	No removal of suitable owl habitat; likely to adversely affect due to noise disturbance; not likely to adversely affect due to removal of dispersal habitat.
Northern Spotted Owl (Critical Habitat)	No effect	May affect and likely to adversely affect due to 2-acre temporary road construction and larger gaps in thinning units. May affect and not likely to adversely affect due to fuels reduction treatments.	May affect and likely to adversely affect due to larger gaps in thinning units.
American Peregrine Falcon (R6 Sensitive and Management Indicator Species)	No impact	No impact	No impact
Harlequin Duck (R6 Sensitive)	No impact	May impact due to noise disturbance, yet this is unlikely	May impact due to noise disturbance, yet this is unlikely
Fisher (Proposed Threatened)	No effect	No effect to fisher but may adversely affect potential habitat , large down wood enhancement on 505 acres may benefit potential habitat	No effect to fisher but may adversely affect potential habitat, large down wood enhancement on 63 acres may benefit potential habitat
Fringed Myotis and Townsend's Big-eared Bat (R6 Sensitive)	No impact	May adversely impact individuals, but would not result in a loss of viability in the project area, nor cause a trend toward federal listing. Harvest in stands over 80	No impact

Resource	Alternative 1	Alternative 2	Alternative 3
		years of age would degrade bat roosting habitat on approximately 424 acres. Subsequent snag creation may offset this impact.	
Johnson's Hairstreak (R6 Sensitive)	No impact	May adversely impact individuals, but would not result in a loss of viability in the project area, nor cause a trend toward federal listing. Only a very small amount of western hemlock habitat would be affected by project activities and the goose units currently have no identified dwarf mistletoe.	No impact
Crater Lake Tightcoil (R6 Sensitive and Survey and Manage Species)	No impact	No impact because all suitable habitat would be protected with a minimum of a 10m no-harvest and no-burn buffer	No impact because all suitable habitat would be protected with a minimum of a 10m no-harvest and no-burn buffer
Cascades Axetail Slug (R6 Sensitive)	No impact	May adversely impact individuals, but would not result in a loss of viability in the project area, nor cause a trend toward federal listing.	May adversely impact individuals, but would not result in a loss of viability in the project area, nor cause a trend toward federal listing.
Oregon Megomphix (Survey and Manage Species)	No impact	May impact suitable habitat on about 2,409 acres	May impact suitable habitat on about 1,069 acres
Red Tree Vole (Survey and Manage Species)	No impact	Would remove or thin about 424 (footprint) acres of higher quality habitat in stands over 80 years of age, and could impact 60 acres with prescribed underburn. No impact to any documented nest areas. May also impact about 1,632 (footprint) acres of lower quality habitat.	No impact to higher quality habitat, may impact about 744 acres of lower quality habitat.
Great Gray Owl (Survey and Manage Species)	No impact	Would create about 43 acres of high quality open foraging habitat, also 281 acres of small gaps may provide benefits	111 acres of small gaps may provide benefits

Resource	Alternative 1	Alternative 2	Alternative 3
Cavity Excavators (Management Indicator Species)	No impact	Snag abundance may initially decline on 2,409 acres, and increase with post-harvest mitigation and enhancement	Snag abundance may initially decline on 1,069 acres, and increase with post-harvest mitigation and enhancement
Elk and Deer (Management Indicator Species)	No impact	Shelterwood harvest and small gaps should increase elk forage quality from "poor "to "higher-marginal" for about 20 years on 43 acres of regen and 281 acres of gaps, plus forage improvements on 1268 thinned acres	Shelterwood harvest and small gaps should increase elk forage quality from "poor "to "higher-marginal" for about 20 years on 111 acres of gaps, plus forage improvements on 499 thinned acres
Pileated Woodpecker (Management Indicator Species)	No impact	424 acres would be degraded in older forest stands over 80 years due to harvest, 60 acres of older stands may gain some snag habitat with underburning, but also may lose a minor number of snags individual tree mortality, and 325 acres	325 acres would be degraded due to hazardous fuels treatments
Marten (Management Indicator Species)	No impact	No impact	Beneficial effect
Bald Eagle (Management Indicator Species)	No impact	No effect	No effect
Northern Goshawk (Land birds preferring older forest habitat)	No impact	Removes about 43 acres of forest habitat between 80-127 years, and thins about 381 acres between 80-127 years of age. Viable populations of goshawks and other migratory birds that use older conifer forests are expected to be maintained at the landscape level.	No impact to older forest habitat
Rufous Hummingbird, Purple Finch (Land birds favoring shrub habitat in early seral conifer stands)	No impact	Creates about 374 acres of complex early seral habitat lasting about 20 years	Creates about 143 acres of complex early seral habitat lasting about 20 years

Resource	Alternative 1	Alternative 2	Alternative 3
Olive-sided Flycatcher (Land birds favoring forest openings with large snags)	No impact	Creates about 374 acres of complex early seral habitat lasting about 20 years, with planned snag mitigation and enhancement at the rate of 0-5/acre	Creates about 143 acres of complex early seral habitat lasting about 20 years, with planned snag mitigation and enhancement at the rate of 0-5/acre
Rare Plants	No effect	Will not adversely affect due to buffers	Will not adversely affect due to buffers
Fungi (Sensitive and Survey and Manage)	No effect	Direct effects may include compaction and loss of host trees in timber harvest treatment areas	Direct effects may include compaction and loss of host trees in timber harvest treatment areas
Special Habitats	No effect	No effect due to buffers	No effect due to buffers
Invasive Plants	No effect	Ground disturbance from harvest and roads would result in the creation of suitable habitat for invasive plants.	Ground disturbance from harvest and roads would result in the creation of suitable habitat for invasive plants.
Roads	Continued decline in road conditions on the 43 miles of roads associated with the project.	Would improve declining road conditions on an estimated 43 miles of road.	Would improve declining road conditions on an estimated 26 miles of road.
Heritage	No effect	Not likely to affect	Not likely to affect
Scenic Quality	No effect	No long term adverse effect to scenic quality would occur. Short term adverse effects would occur adjacent to Frissell Trail and a viewpoint located on Highway 126. Some improvement to scenery would occur adjacent to the secondary forest road system.	No long term adverse effect to scenic quality. Some improvement to scenery would occur adjacent to the secondary forest road system but to a lesser degree than in Alternative 2.
Recreation	No effect	Temporary adverse effects due to trail closures, increased noise, Frissell dust and log truck traffic during harvest activity. Long term beneficial effects include improved access to dispersed recreation areas due to road maintenance, improved scenery from secondary forest roads and an enlarged and improved trailhead parking area at Frissell trail.	Temporary adverse effects due to trail closures, increased noise, dust and log truck traffic during harvest activity. Long term beneficial effects include improved access to dispersed recreation areas due to road maintenance, improved scenery from secondary forest roads and an enlarged and improved trailhead parking area at Frissell trail.

Resource	Alternative 1	Alternative 2	Alternative 3
Wilderness	No effect	No effect	No effect
Areas suitable for inclusion in the National Wilderness Preservation System	No effect	Area would be decreased by approximately 1,191 acres (11.5 %). Remaining area would be approximately 9,162 acres.	Area would be decreased by approximately 15 acres (.14%). Remaining area would be approximately 10,338 acres.
Inventoried Roadless Area (IRA)	No effect	No effect	No effect
Air Quality	No effect	Impacts on air quality from smoke emissions would not exceed state mandated policy.	Impacts on air quality from smoke emissions would not exceed state mandated policy.
Economics	No contribution to local economy, forest sector jobs, or the National Forest Fund (NFF) would result. If not replaced by another project, Alternative 1 could contribute to a continued decline in forestry and milling related jobs.	Approximately 35 million board feet of timber would be contributed to local economy, forest sector jobs, and county governments via timber revenue and the National Forest Fund (NFF) would result. Jobs associated with timber harvest and production would contribute to the local economy with direct and indirect jobs and increased tax revenue to the government from those jobs.	Approximately 9 million board feet of timber would be contributed to local economy, forest sector jobs, and county governments via timber revenue and the National Forest Fund (NFF) would result. Jobs associated with timber harvest and production would contribute to the local economy with direct and indirect jobs and increased tax revenue to the government from those jobs.

Chapter 1 - Purpose and Need

1.1 Introduction

The McKenzie River Ranger District is proposing to provide a sustainable supply of timber, reduce hazardous fuels in the McKenzie Bridge Wildland-Urban Interface (WUI), and actively manage stands to improve stand conditions, diversity, density and structure in 2,452 acres on the Willamette National Forest.

The project area encompasses 17,932 acres along Highways 126 and 242, near the community of McKenzie Bridge, Oregon (Figure 1 and 2). The project area is located in the Florence Creek-McKenzie River; Elk Creek-McKenzie River; and Lost Creek 6^{th} field watersheds (Figure 3). The legal description is: Township 16 South, Range 5 East, Sections 1-4, 9-15; Township 16 South, Range 6 East, Sections 7-11, 14-18, and 20-23.

14,713 acres in the project area are managed by the Willamette National Forest with the remaining 3,219 acres belonging to private land holders. The project area is composed mostly of a Douglas-fir and western hemlock overstory, with an understory shrub component of vine maple, salal, dwarf Oregon grape, sword fern and Pacific rhododendron. Prior to the 1940's, fire was a dominant disturbance in the project area. Records indicate four large, stand replacing wildfires have occurred in the project area over the past 100 years and approximately 69 smaller, low to moderate severity fires since the 1970s. More recently, timber harvest, including thinning, partial cut, and regeneration harvest has been the dominant disturbance in the project area over the last 100 years.

The project area is popular for several recreational activities. Driving for pleasure (sightseeing) is a popular activity, primarily during the summer months when roads are open and free of snow. Two National Scenic Byways pass through the project area; the West Cascades National Scenic Byway and the McKenzie Pass-Santiam Pass National Scenic Byway. The McKenzie River flows through the project area between Belknap Springs and McKenzie Bridge Campground. The McKenzie River is regionally and nationally known for its outstanding recreational opportunities and scenery. Portions of the McKenzie River National Recreation Trail (4.5 miles) also pass through the project area. This trail receives very high use and is nationally renowned for hiking and mountain biking. Three developed campgrounds, McKenzie Bridge, Paradise, and Limberlost, as well as 15 dispersed camp sites are located in the project area.

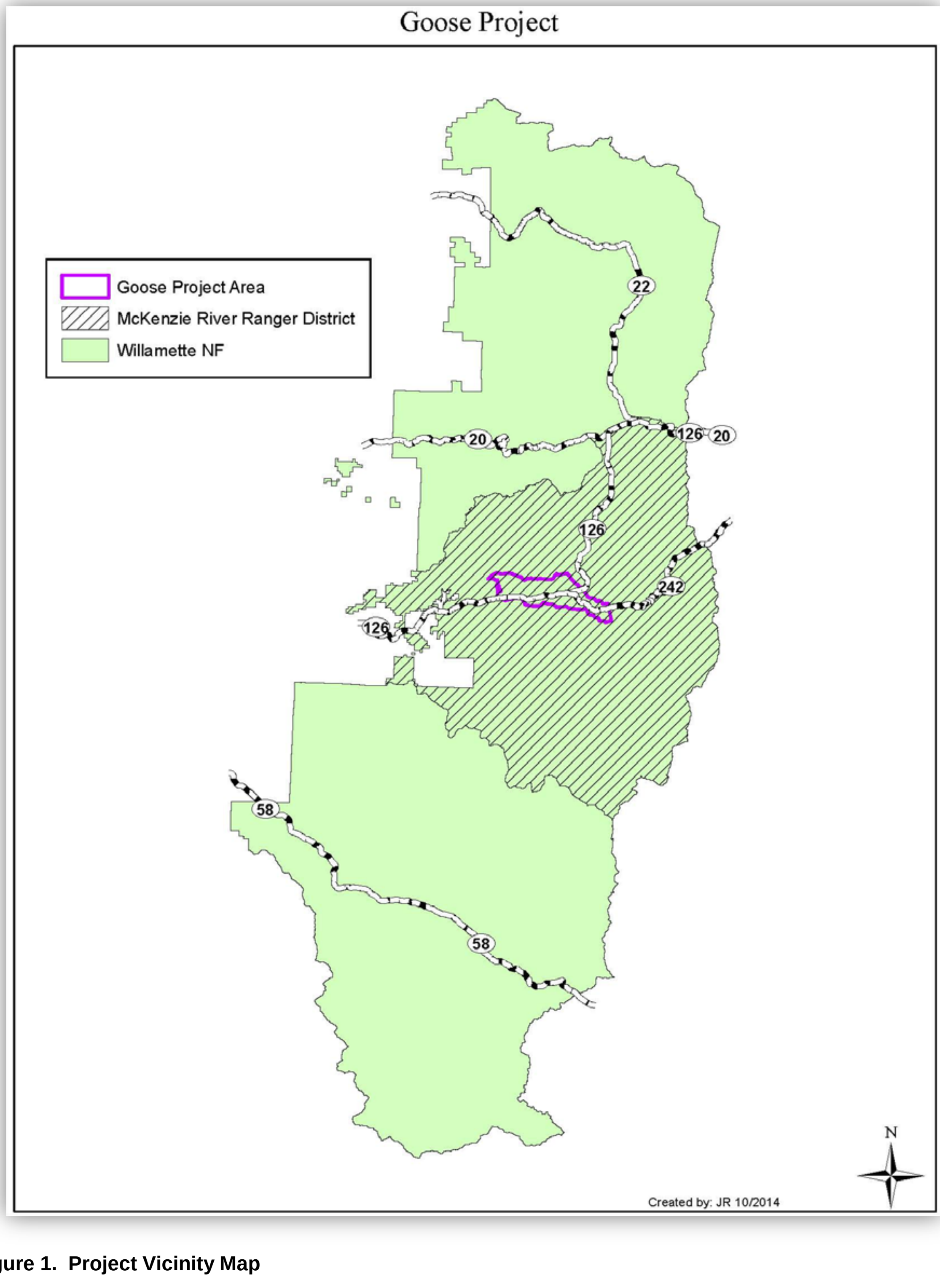

Figure 1. Project Vicinity Map

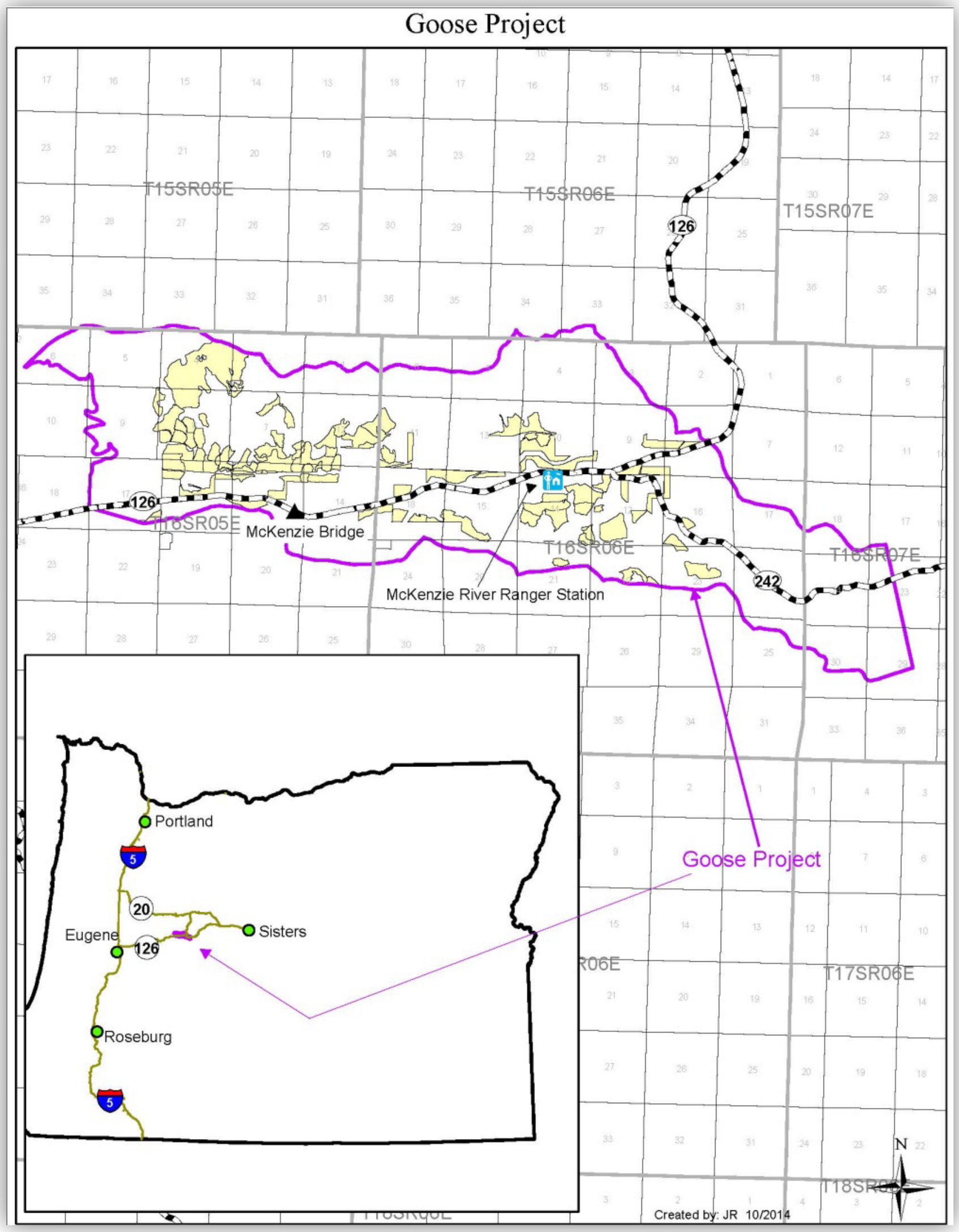

Figure 2. Goose Project Area

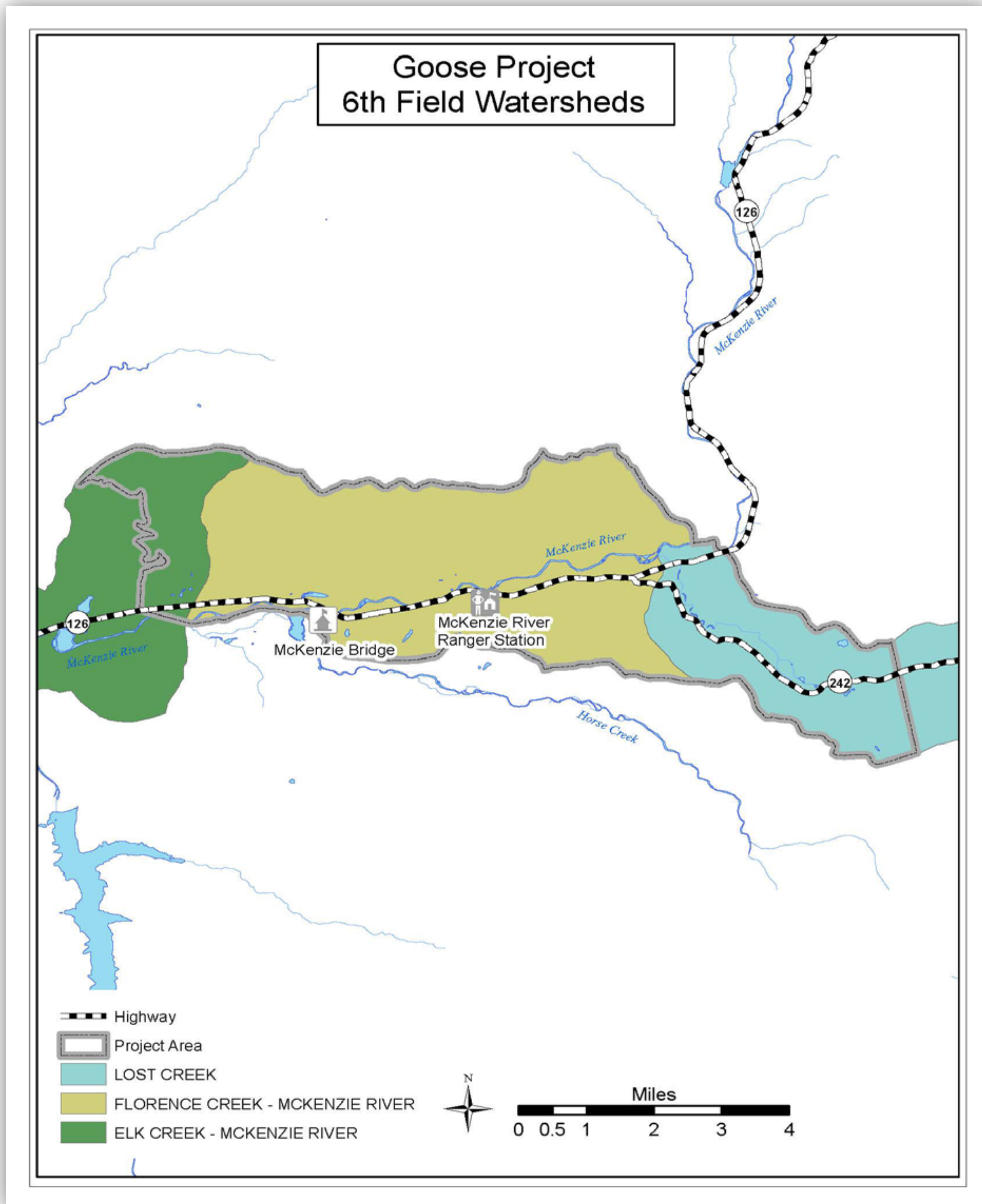

Figure 3. 6th Field Watersheds within the Project Area

1.2 History of the Goose Project

In 2010, the McKenzie River Ranger District prepared an Environmental Assessment and approved a subsequent Decision Notice and Finding of No Significant Impact (FONSI) for the Goose project. The Decision Notice, approved September 13, 2010, selected Alternative 2, which approved thinning on 1,443 acres; dominant tree release on 11 acres; gap creation on 322 acres; regeneration harvest on 41 acres and skips on 283 acres.

In November 2010, three organizations appealed the Goose project. Two appellants, Cascadia Wildlands and Oregon Wild, requested that the Responsible Official withdraw the decision and issue a new one adopting Alternative 3. The third appellant, American Forest Resource Council, requested the decision be remanded and Alternative 2 be selected without modification. The Forest Service conducted an appeal review in accordance with 36 CFR 215 and regional procedures. On December 16, 2010, the Appeal Deciding Officer determined the 2010 Decision Notice was in compliance with law, regulation, and policy and denied the appellants requested relief. Implementation of the Goose project began in 2011 with the sale of three contracts for timber harvest and removal. Two timber sale contracts were awarded to Seneca Sawmill Company, and one to Freres Lumber Company Inc.

On May 12, 2012, Cascadia Wildlands and Oregon Wild filed a formal complaint against the Forest Service in the United States District Court for the District of Oregon (*Cascadia Wildlands and Oregon Wild v. USFS*), effectively halting the Goose project. The plaintiffs (Cascadia Wildlands and Oregon Wild) asserted the Forest Service failed to disclose environmental information, specifically habitat competition between the spotted owl and the barred owl and the consequences of logging in critical Riparian Reserves. Plaintiffs further asserted the project proposed actions may significantly affect the environment and therefore, under NEPA requirements, an Environmental Impact Statement (EIS) should have been prepared. In March 2013, U.S. Magistrate Judge Ann Aiken concluded that while the Forest Service did adequately disclose environmental information, the potentially significant effect to the environment from the Goose project triggered NEPA requirements that the Forest Service prepare an EIS. Accordingly, the Forest Service was enjoined from going forward with the Goose project until an EIS was prepared.

This final Environmental Impact Statement (FEIS) has been prepared to revise the 2010 environmental analysis and decision for the Goose Project Environmental Assessment as directed by a 2013 U.S. District Court order. By preparing this FEIS, the Willamette National Forest is fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations.

1.3 Purpose and Need for Action

The purpose of the proposed project is to, (1) Provide a sustainable supply of timber products, (2) Reduce hazardous fuels in the McKenzie Bridge Wildland-Urban Interface (WUI), and (3) Actively manage stands to improve stand conditions, diversity, density, and structure.

Provide a Sustainable Supply of Timber Products

Why Consider Taking Action: The proposed project is needed to ensure the Willamette National Forest continues to supply a reliable supply of timber products as directed by the laws and guidance below and in doing so contributes to the stability of local, regional, and national economies and achieves the annual Probable Sale Quantity (PSQ) target for the Forest.

Several laws direct and allow the Forest Service to provide the sustainable harvest of trees from the Nation's forests including Multiple-Use Sustained-Yield Act of 1960 and the National Forest Management Act of 1976. One of the strategic goals of the Forest Service is to provide and sustain benefits to the people of the United States and the world as a whole. To accomplish this goal, one of the objectives is to provide a reliable supply of forest products over time consistent with achieving the desired conditions on National Forest System (NFS) lands and to maintain or create processing capacity and infrastructure in local communities. (USDA Strategic Plan FY 2014-2018). Additionally, the Willamette National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan, includes goals to produce an optimum and sustainable yield of timber that helps maintain the stability of local and regional economies, and contribute valuable resources to the national economy on a predictable and long-term basis.

Probable Sale Quantity (PSQ) is an estimate of probable harvest levels that could be maintained on a forest annually (Northwest Forest Plan 1994). PSQs represent neither minimum levels that must be met nor maximum levels that cannot be exceeded. Rather, PSQs represent the best assessment of the average annual amount of timber harvest that could occur on a forest without decline, over the long term, if the schedule of harvests and regeneration are followed (Northwest Forest Plan 1994). PSQ can vary and change over time depending on acres available for harvest, expected acre yields and Forest direction.

Existing Condition: The current PSQ annual target for the Willamette National Forest is 111 million board feet (MMBF) as amended by the Approval of PSQ Estimates for Northwest Forest Plan Forests (1998).

Desired Condition: Through implementation of the proposed action, the McKenzie River Ranger District would contribute approximately 35 MMBF to the Willamette National Forest PSQ target over a two year period (approximately 17.5 MMBF/year).

Reduce Hazardous Fuels in the McKenzie Bridge Wildland-Urban Interface (WUI)

Why Consider Taking Action: The proposed project is needed to treat hazardous fuels in the McKenzie Bridge WUI to reduce potential wildfire impacts and risks to the many private dwellings and residents in the project area.

Existing Condition: Fire suppression over the past century has resulted in increased fuel loading throughout forest ecosystems. This increased fuel loading consists of surface fuels, ladder fuels (small trees and brush that can carry fire into larger tree crowns), and dense overstory canopies. Much of the Forest Service land surrounding communities and private residences in the project area currently exhibits a fuel profile conducive to high severity wildfires through continuous tree canopies, dense understory, and/or areas of high surface fuel loadings.

Desired Condition: Reduced horizontal and vertical continuity of fuels in and around the McKenzie Bridge Wildland-Urban Interface to decrease potential impacts and risks to people, structures, and resources in the event of a wildfire.

Actively Manage Stands to Improve Stand Conditions, Diversity, Density and Structure

The proposed project is needed to improve stand conditions, diversity, density, and structure in the project area, providing benefits to vegetation, wildlife, and overall health of the forest.

Increase Stand Health and Vigor

Why Consider Taking Action: Seventy-four percent of previously managed stands and fire regenerated stands proposed for harvest in the project area are classified as overstocked. Overstocked stands occur when trees are closely or densely spaced, resulting in a competition for resources. Closely spaced trees competing for resources generally result in decreased individual tree growth. Overstocked stands can also cause increased tree/stand stress, resulting in increased susceptibility to insect and disease outbreaks. Additionally, overstocked stands can increase the potential for high severity wildfires.

The proposed project would help improve stand conditions, diversity, density and structure with thinning, gaps, and dominant tree release. Thinning the overstocked stands would make more growing space and resources available to the remaining trees, resulting in decreased tree stress and development towards larger diameter stands. Stand vigor would also be increased as released trees develop into larger trees sooner, accelerating the development of some late successional characteristics. Tree species, age, and structure diversity would be maintained or enhanced.

The Stand Density Index (SDI), which is a qualitative measure of tree competition within a stand, ranges from 214 to 554 and averages 366 for all stands being considered for treatment in the Goose project area. In Douglas-fir, the maximum SDI (SDImax) is 595 (Reineke 1933). As a stand reaches an SDI of about 149, or approximately 25 percent of SDImax, trees within the stand start to compete with each other. As SDI increases to around 357, or 60 percent SDImax, trees reach a point at which they start dying due to competition, or self-thinning (Long, 1985).

Existing Condition: Seventy-four percent of previously managed stands and fire regenerated stands proposed for harvest in the project area are overstocked with an average SDI of 366 or 60 percent of SDImax.

Desired Condition: Healthy, vigorous stands with an average SDI of 200.

Increase the Amount of Early Seral Habitat

Why Consider Taking Action: Age class diversity in forest stands is important as some species of animals and plants depend on younger stages of forests for their feeding, nesting, and breeding requirements, whereas other species thrive in middle age or old forests. Early seral habitat (defined as less than 20 years old) is of key importance to an estimated 156 species of wildlife in the central Oregon Cascades (O'Neil et al 2001).

Historically, early seral habitat in the project area was created from stand-replacing fires and regeneration harvest. Changes in forest management on Federal lands in the past 30 years, including fire suppression and reduced regeneration harvest have resulted in fewer acres of early seral habitat creation. Additionally, fire suppression and reduced regeneration harvest have resulted in a much higher proportion of dense, closed canopy stands. Consequently, there is less structurally rich and diverse quality early seral habitat in the project area than in the past. Currently, early seral habitat within the Goose project area is only partially effective (marginal) at providing quality diverse early seral habitat due to the lack of vertical and horizontal stand structure. A small amount of early seral habitat is present surrounding rock outcrops in the higher elevations of the planning area. There are very few open meadows in the project area.

There is a need to enhance, create, and maintain diverse quality and structurally rich early seral habitat to support wildlife species that have been documented to depend on early seral habitat, such as elk, black-tailed deer, rufous hummingbirds, olive-sided flycatchers, and a large number of butterfly and moth species.

Existing Condition: Less than one percent early seral habitat (defined as less than 20 years old) in the project area.

Desired Condition: Increase early seral habitat to approximately three percent in the project area.

Increase the Potential for Riparian Reserves to Function as Late Successional Habitat

Why Consider Taking Action: Treatment of stands in Riparian Reserves would accelerate the ability of Riparian Reserves to provide adequate stream shade, root strength and bank stability, sediment filtration and nutrient cycling, large wood supply to waterbodies and floodplains, organic matter input, and habitat for riparian-dependent wildlife.

Existing Condition: Portions of Riparian Reserves within project area units consist of dense, overstocked, conifer-dominant stands with very little structural and species diversity and understory development. This lack of complexity and diversity is outside the natural range of variability and may be limiting nutrient cycling, deciduous organic matter input to waterbodies, and habitat for riparian-dependent wildlife

Desired Condition: Maintain conditions in currently functioning portions of Riparian Reserves. In overstocked, conifer-dominant portions lacking structural and species diversity, use silvicultural tools to acquire desired vegetation characteristics needed to more quickly attain Aquatic Conservation Strategy Objectives (Appendix E).

1.4 Proposed Action

Changes to the Proposed Action since the 2010 Analysis

Based on further review of existing data, additional field surveys, and reassessment of critical habitat for northern spotted owls, several changes have been made to the proposed action since the 2010 analysis. Table 3 summarizes these changes.

Table 3. Changes to the Proposed Action since the 2010 Analysis

Unit	Change	Reason for Change
Timber Harvest Units		
160,170, 180, 730	Dropped	Determined not economically feasible due to low volume per acre
330 - portion that overlaps critical habitat	Dropped	Portions of unit designated as critical habitat
520	Dropped	Riparian buffers created slivers which made unit impractical to harvest
Wildland-Urban Interface (WUI) Units		
810 - portion that overlaps critical habitat	Dropped	Portions of unit designated as critical habitat. Underburning would potentially harm two nest sites
830, 840, 970, 980, 981	Dropped	Hazardous fuels treatments completed prior to lawsuit/injunction
880	Dropped	Additional field surveys indicated no need for treatment
Riparian Reserves		
90, 100, 200, 300, 420, 440, 450, 470, 480, 490, 500, 570	No thinning within 172 feet* of waterbodies	Based on further review of existing data and additional field surveys, it

Unit	Change	Reason for Change
		was determined that thinning is not needed within 172 feet of these waterbodies to achieve ACS Objectives
70, 320, 330, 340, 350	Dead and down wood creation added	Where current dead and down wood estimates are well below historic ranges, dead and down wood creation is proposed so that important wildlife habitat needs are met
390	Harvest buffers on Class 4 streams expanded from 30 feet to 60 feet	Based on further review of existing data and additional field surveys, harvest buffers were expanded to account for a larger primary wood recruitment zone
600	Harvest buffer on fish-bearing stream (Class 2) expanded from 60 feet to 172 feet	Based on further review of existing data and additional field surveys, it was determined that thinning is not needed within 172 feet of this stream to meet ACS Objectives
550	Harvest buffer on fish-bearing stream (Class 2) expanded from 60 feet to 90 feet	Based on further review of existing data and additional field surveys, it was determined that thinning is not needed within 90 feet of this stream to meet ACS Objectives
All units with post-harvest fuels treatments near waterbodies (see Riparian Reserve Treatment Table for details)	Post-harvest fuels treatment buffers expanded from 30/60/90 feet (depending on stream class) to 60/90/172 feet	Because harvest buffers changed on many units (as described above), the post-harvest fuels treatment buffers were also modified to match the harvest buffers for each waterbody
800, 820, 870, 930, 940, 950, 960, 990	No natural fuels underburning or hazardous fuels treatments within 172 feet* of waterbodies	Based on further review of existing data and additional field surveys, it was determined that hazardous fuels treatments are not needed within 172 feet of these waterbodies to meet ACS Objectives
Potential Wilderness Area (PWA) –		
PWA and Forest Service Planning Directives	PWAs are hereby known as “areas that may be suitable for inclusion in the National Wilderness Preservation System.”	Forest Service Handbook 1909.12, Chapter 70 amended effective January 30, 2015, changing terminology and criteria for analysis of areas that may be suitable for inclusion in the National Wilderness Preservation System.
Transportation		
Permanent Road Construction (1 Mile)	Removed	Units the road was designed to access were dropped or reduced

*172 feet is one site potential tree height for the project area, also known as the Stream Influence Zone

Revised Proposed Action

The proposed action would treat approximately 2,452 acres in the project area. Harvest treatments proposed include thinning, dominant tree release, gap creation, regeneration harvest and skips. Fuels treatments include mechanical treatments, post-harvest underburn, natural fuels underburn, and hazardous fuels treatments. A detailed description of proposed treatments and project activities is located in Appendix A.

As stated in Section 1.3, the purpose and need for action includes:

1. Provide a sustainable supply of timber products;
2. Reduce hazardous fuel in the McKenzie Bridge Wildland-Urban Interface (WUI); and
3. Actively manage stands to improve stand conditions, diversity, density, and structure.

Table 4 illustrates the proposed treatments, connected actions, and the purpose and need they address.

Table 4. Proposed Action Treatments and Connected Actions

Proposed Activity	Unit of Measure	Proposed Action	Purpose – Need Addressed
Timber Harvest Treatments			
Thinning outside Riparian Reserves	Acres	1,080	1, 2, 3
Thinning in Riparian Reserves	Acres	138	3
Regeneration Harvest	Acres	43	1, 3
Gaps	Acres	281	1, 2, 3
Dominant Tree Release	Acres	50	1, 3
Skips outside Riparian Reserves	Acres	173	3
Skips in Riparian Reserves	Acres	291	3
Total	**Acres**	**2,056**	-
Estimated Volume	**MMBF**	**~35**	**1**
WUI Fuels Treatments – No Timber Harvest			
Natural Fuels Underburn outside Riparian Reserves	Acres	33	2, 3
Natural Fuels Underburn in Riparian Reserves	Acres	0	3
Hazardous Fuels Treatment outside Riparian Reserves	Acres	189	2, 3
Hazardous Fuels Treatment in Riparian Reserves	Acres	136	2, 3
Skips (associated with WUI)	Acres	38	2, 3
Total WUI Fuels Treatment	**Acres**	**396**	

Proposed Activity	Unit of Measure	Proposed Action	Purpose – Need Addressed
Post-Harvest Fuels Treatments[1] in Timber Harvest Units			
Pile and Burn (mechanical and/or hand treatments)[2]	Acres	624	2
Post-Harvest Underburn [3]	Acres	477	2, 3
Connected Actions			
Harvest System			
Helicopter	Acres	215	-
Skyline	Acres	582	-
Ground	Acres	795	-
Transportation			
Temporary Roads	Miles	6.9	-
Road Maintenance/Haul Route	Miles	43	-
Post-Harvest Planting			
Planting in Regeneration Harvest	Acres	~43	3
Planting in Gaps	Acres	~77	3
Natural Regeneration in Gaps	Acres	~204	3
Other			

- **Subsoiling:** Subsoiling would occur in harvest units where needed to keep compaction below Forest Standards and Guidelines for high compaction levels Subsoiling would also occur on skid roads located in regeneration harvest units and gaps.
- **Temporary Road Decommissioning:** Temporary roads in the project area would be decommissioned upon completion of activities or connected activities such as firewood gathering.
- **Scarifying Temporary Roads:** Soils may be scarified to aid in vegetation establishment.
- **Down Wood and Snag:** At least 240 lineal feet per acre of decay class I and II material greater than 20” diameter and 20 feet in length would be retained within the regeneration harvest units. Where the preferred size of material is not available, 240 lineal feet per acre of the next largest trees proposed to be harvested would be left. On average 4 snags (or live trees for snag creation) per acre would also be left in the regeneration harvest units.

[1]: Post-harvest fuels treatments methods may change depending on feasibility and funding. Post-harvest fuels treatments would occur in timber harvest units; therefore the acreage of post-harvest fuels treatments are not included in the total acres of treated units.

[2]: Mechanical treatment may include: grapple piling in slash concentrations, yarding tops attached, mastication, or any other mechanical device).

[3]: These acres are possible underburn acres due to dbh and location, not all acreage may be underburned. Acreage not underburned may have other post-harvest fuels treatments assigned before implementation.

1.5 Forest Plan and Management Direction

This final Environmental Impact Statement (FEIS) is tiered to the following EISs and plans, which are incorporated by reference:

- The Willamette National Forest Land and Resource Management Plan Environmental Impact Statement, as amended (USDA Forest Service 1990; referred to as the “Forest Plan”)
- The Northwest Forest Plan and Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Related Species with the Range of the Northern Spotted Owl (USDA Forest Service and USDI Bureau of Land Management 1994a; referred to as the “Northwest Forest Plan”)
- The Forest Plan as amended by the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA Forest Service and USDI Bureau of Land Management 2001)
- The Environmental Impact Statement and Record of Decision for Preventing and Managing Invasive Plants (USDA Forest Service 2005).

The Forest Plan “guides all natural resource management activities and establishes management standards and guidelines for the Willamette National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resources management” (Forest Plan, I-1). The Forest Plan provides management direction through the designation of specific management areas and standards and guidelines specific to these designations.

The Forest Plan was amended by the Northwest Forest Plan (1994), which established additional management areas, standards, and guidelines associated with Matrix, Riparian Reserves, Adaptive Management Areas, and Late-Successional Reserves. When there is overlap of management areas, the more restrictive standards and guidelines apply (Northwest Forest Plan 1994a p. A-6). Figure 4 and 5 illustrate the Forest Plan and Northwest Forest Plan management areas. Table 5 displays Forest Plan management areas, Northwest Forest Plan land management areas and proposed action unit acres for the proposed action.

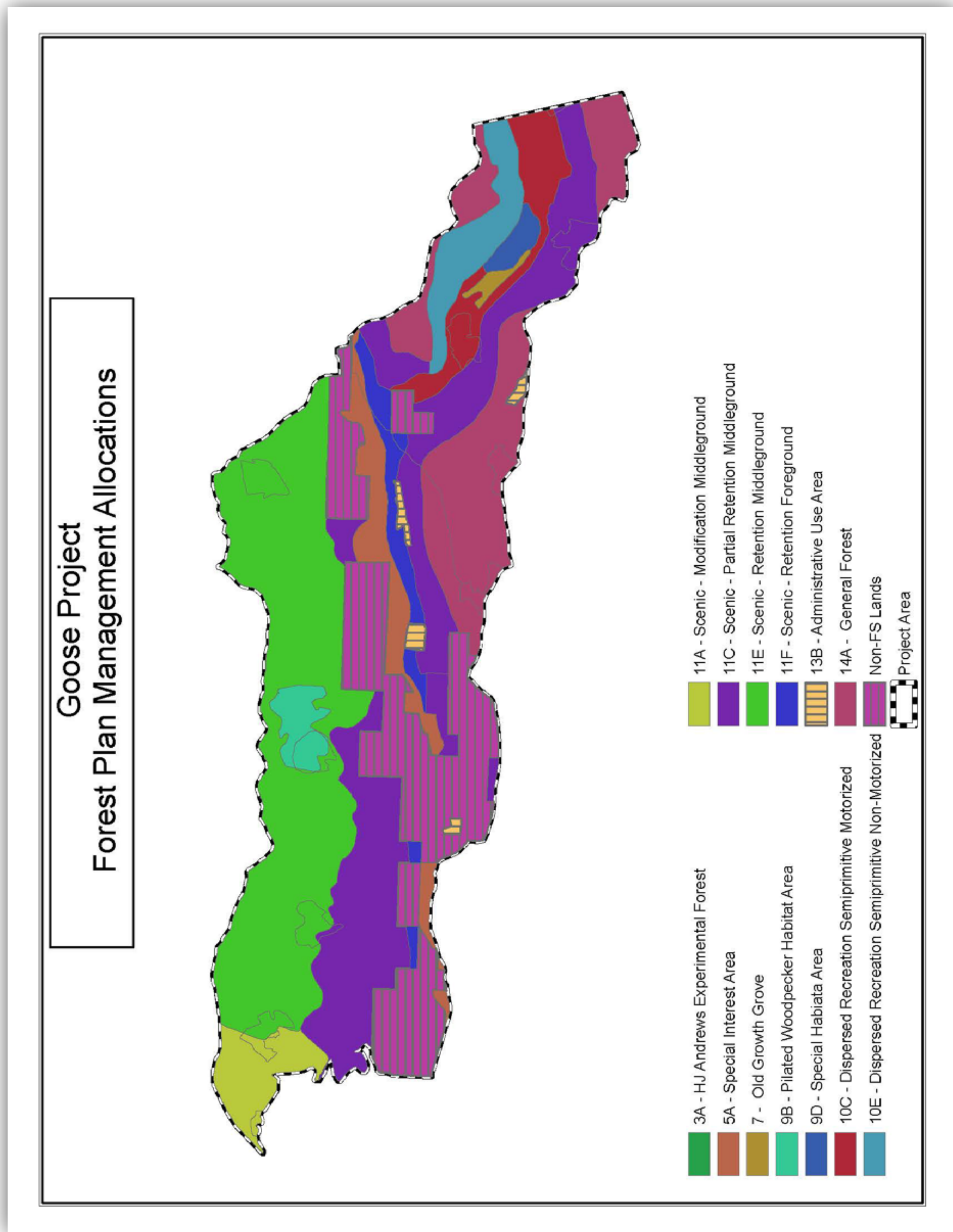

Figure 4. Willamette Forest Plan Management Areas in the Goose Project Area

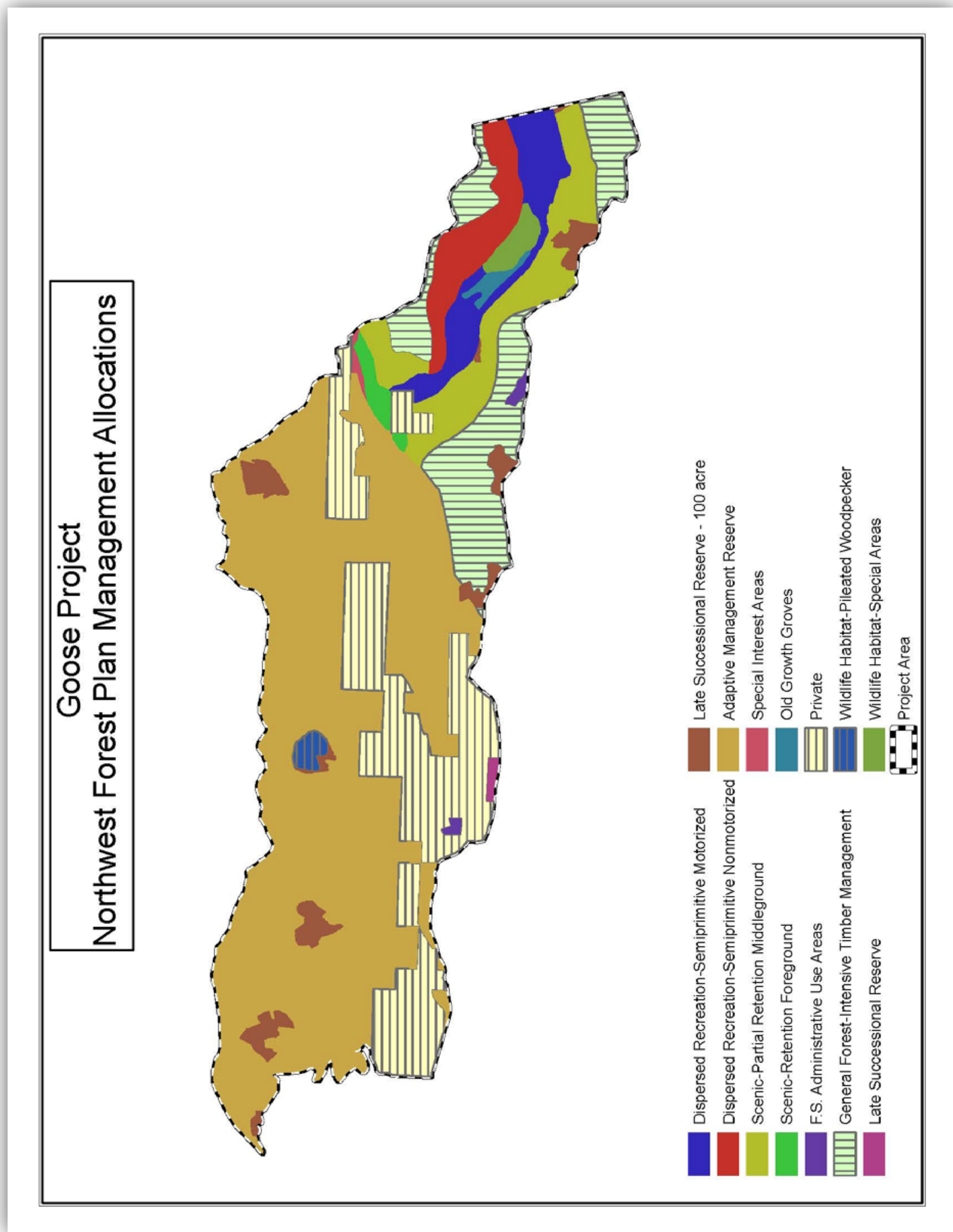

Figure 5. Northwest Forest Plan Management Areas in the Goose Project Area

Table 5. Land Management Areas (MA) in Project Area and Proposed Treatment Acres (Alternative 2)

Forest Plan Management Areas (MA)	Northwest Forest Plan Management Areas (MA)	Acres in Project Area	Proposed Action Acres		
			Timber Harvest	WUI	Total
HJA Experimental Forest (3A)	Adaptive Management Area (17)	3	0	0	0
Special Interest Areas (5A)		35	0	19	19
Special Interest Areas (5A)	Adaptive Management Area (17)	744	2[1]	230	232
Old Growth Groves (7)		72	0	0	0
Wildlife Habitat – Pileated Woodpecker (9B)	100-acre Late Successional Reserve (16B)	91	0	0	0
Wildlife Habitat – Pileated Woodpecker (9B)	Adaptive Management Area (17)	216	0	0	0
Wildlife Habitat – Special Areas (9D)		149	0	0	0
Dispersed Recreation – Semiprimitive Motorized (10C)		674	0	0	0
Dispersed Recreation – Semiprimitive Motorized (10C)	100-acre Late Successional Reserve (16B)	99	0	15	15
Dispersed Recreation – Semiprimitive non-motorized (10E)		683	0	0	0
Scenic Modification Middleground (11A)	Adaptive Management Area (17)	544	0	0	0
Scenic Modification Middleground (11A)	100-acre Late Successional Reserve (16B)	51	0	0	0
Scenic Partial Retention Middleground (11C)	Matrix (14)	1,279	30	14	44
Scenic Partial Retention Middleground (11C)	Adaptive Management Area (17)	2,408	1003	99	1102
Scenic Partial Retention Middleground (11C)	Late Successional Reserve (16A)	30	0	0	0
Scenic Partial Retention Middleground (11C)	100-acre Late Successional Reserve (16B)	122	0	0	0
Scenic Retention Middleground (11E)	100-acre Late Successional Reserve (16B)	285	0	0	0
Scenic Retention Middleground (11E)	Adaptive Management Area (17)	4,325	601	19	620
Scenic Retention Foreground (11F)	Matrix (14)	146	0	0	0
Scenic Retention Foreground (11F)	Adaptive Management Area (17)	348	63	0	63
Administrative Use Site (13B)	Adaptive Management Area (17)	81	0	0	0
Administrative Use Site (13B)		45	0	0	0

Forest Plan Management Areas (MA)	Northwest Forest Plan Management Areas (MA)	Acres in Project Area	Proposed Action Acres		
			Timber Harvest	WUI	Total
General Forest (14A)	Matrix (14)	1,864	209	0	209
General Forest (14A)	100-acre Late Successional Reserve (16B)	110	0	0	0
General Forest (14A)	Adaptive Management Area (17)	322	148	0	148
Riparian Areas (15)	Riparian Reserves (15)	4,280	429	163	592
Private Land (not a management allocation)		3,206	0	0	0
Total Land Allocations[2]		**17,932**	**2,056**	**396**	**2,452**

[1]: Skips (no harvest)
[2]: Does not include Riparian Reserves which overlay other allocations.

The following management direction is relevant to management allocations with proposed treatments in the project area:

Forest Plan

Special Interest Areas (5A) within the project area that have proposed treatments include the McKenzie River Special Interest Area. The purpose of Special Interest Area is to preserve lands that contain exceptional scenic, cultural, biological, geological, or other unusual characteristics. Timber management may not be implemented for the purpose of programmed harvests, but it may be implemented for treatments that maintain or enhance the values identified in the Implementation Guides for these areas.

Dispersed Recreation- Semiprimitive Motorized (MA 10C) areas are to provide a full spectrum of recreation opportunities meeting the criteria for a Semiprimitive Motorized experience through the management of user activities and natural resource settings. These areas are to provide users the opportunity to experience a sense of solitude, tranquility, self-reliance and closeness to nature. These experiences are provided through activities involving the application of outdoor skills in an environment that offers some challenge and risk. These areas are also to provide for the conservation of unique geographic, topographic, biological, and ecological processes, as well as scenic, wildlife, recreation, and watershed values.

Scenic-Partial Retention Middleground (11C) areas that have the objective to **c**reate and maintain desired visual characteristics of the forest landscape through time and space. Visually sensitive landscapes would be managed for a moderate level of scenic quality. This area would also be managed for other resource goals including timber production, recreation opportunities, watershed protection, and maintenance of wildlife habitats.

Scenic-Retention Middleground (11E) areas have an objective to create and maintain desired visual characteristics of the forest landscape through time and space. Visually sensitive landscapes would be managed for a high level of scenic quality. This area may also be managed for other resource goals including maintenance of wildlife habitats, recreation opportunities, watershed protection, and timber production.

Scenic-Retention Foreground (11F) areas that have the objective to **c**reate and maintain desired visual characteristics of the forest landscape through time and space. Visually sensitive landscapes would be managed for a high visual quality. This area may also be managed for other resource goals including maintenance of wildlife habitats, recreation opportunities, watershed protection, and timber production.

General Forest (14 A) consists of areas outside of other Land Management Allocation categories where most of the timber treatments occur to produce an optimum and sustainable yield of timber production that is compatible with multiple use objectives.

Northwest Forest Plan

General Forest-Matrix Lands (14A) consists of areas outside of other Northwest Forest Plan land allocation categories where intensive timber management takes place and most of the timber treatments occur to produce an optimum and sustainable yield of timber production that is compatible with multiple use objectives.

Riparian Reserves (MA 15) are areas where the conservation of aquatic and riparian-dependent, terrestrial resources receives primary emphasis. In these areas all streams, wetlands, ponds, lakes, and unstable or potentially unstable areas are included and managed for the purpose of protecting the health of the aquatic system and its dependent species.

Managed Late Successional Reserves (MA 16B) are either mapped managed spotted owl pair areas or unmapped protection buffers. Manage pair areas are delineated for known northern spotted owl activity centers. Protection buffers are designed to protect certain rare and locally endemic species.

Adaptive Management Area (MA 17) is an allocation from the 1994 Northwest Forest Plan that is designed to develop and test new management approaches to integrate and achieve ecological, economic, and other social and community objectives.

1.6 Tribal Consultation

Tribal consultation for the Goose project began in 2009 during the development of the environmental assessment. The McKenzie River Ranger District consulted with the Klamath Tribes, the Confederated Tribes of Grand Ronde, the Confederated Tribes of Siletz Indians and the Confederated Tribes of Warm Springs. On November 2, 2009 the Tribes received a consultation package that included information about the proposed project location, proposed actions, and the purpose and need for the project. Additionally the consultation invited the Tribes to provide any comments or concerns regarding the proposed project. One comment was received from the Confederated Tribes of the Grand Ronde.

During development of the Goose project, a consultation package and invitation to comment was sent to the Tribes listed above on May 27, 2014. No comments were received. The Tribes were invited to provide comment on the DEIS during the 45-day comment period from March 6th through April 20th, 2015 and to attend public meetings in Leaburg and McKenzie Bridge, Oregon in March of 2015. No comments were received. The Goose project has been presented at annual individual Willamette National Forest and Tribal meetings since 2010.

1.7 Public Involvement Efforts

Public involvement efforts during the development of the FEIS included public meetings, open-houses, scoping letters, field trips, meetings with interested parties and landowners, and publication of the project in the Willamette National Forest Schedule of Proposed Actions and Willamette National Forest website. Below is a timeline illustrating public involvement efforts for the Goose project:

- April 30, 2014: Notice of Intent (NOI) to prepare an EIS published in the Federal Register
- April 24, 2014; May 1, 2014: District open-house public meetings at McKenzie Bridge, Oregon
- May 2, 2014: Public meeting to discuss Goose project held in McKenzie Bridge, Oregon
- May 9, 2014: Public meeting to discuss Goose project held in Leaburg, Oregon
- May 27, 2014: Scoping letter and background information mailed to members of the public, organizations, and state/federal agencies that have expressed interest in receiving information on District projects
- July1, 2014: Project published in the Willamette National Forest Schedule of Proposed Actions
- March 6, 2015: Notice of Availability (NOA) and initiation of 45-day comment period for Draft Environmental Impact Statement (DEIS) published in the Federal Register
- March 9, 2015: Notice of Availability (NOA) and initiation of 45-day comment period for DEIS published in the *Register Guard*
- March 24, 2015: Public meeting to discuss Goose project held in Leaburg, Oregon
- March 25, 2015: Public meeting to discuss Goose project held in McKenzie Bridge, Oregon
- April 14, 2015: Public field trip to view and discuss Goose project.

Additionally, the McKenzie River District Ranger and other staff met with the McKenzie Clearwater Coalition, the Blue McKenzie Lions Club, Congressmen Peter DeFazio, staff from Senators Jeff Merkley and Ron Wyden's office, and multiple landowners with property adjacent to the project area. The Responsible Official personally responded to over 150 emails and 50 phone calls regarding the project.

Members of the public, organizations, and state and federal agencies were invited to provide comments and concerns about the Goose project during the public scoping comment period from April 30th through June 16th, 2014. Scoping comments received varied from those that wanted more clarification on proposed activities to specific suggestions for project implementation. Scoping comments were used to help develop planning issues, alternatives, and effects analysis for the DEIS.

Members of the publics, organization, and state and federal agencies were invited to provide comment on the DEIS during the 45-day comment period from March 6th through April 20th, 2015. Approximately 700 letters were received from members of the public, federal officials, public interest organizations, and private businesses. Comments received varied from general statements of support or opposition to requests for additional analysis. Comments on the DEIS and the corresponding responses are located in Appendix G. A complete record of all letters, including names and addresses of individuals, agencies, and organizations that submitted a letter during the 45-day comment period, is available online in the Goose EIS Public Reading Room at https://cara.ecosystem-management.org/Public//ReadingRoom?Project=45853

All correspondence and comments are available in the Project Record at the McKenzie River Ranger District office.

1.8 Consultation with other Agencies

United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)

Upper Willamette River Chinook Salmon and Bull Trout

Endangered Species Act (ESA) informal consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) for Upper Willamette River spring Chinook salmon and Columbia River bull trout was completed during the development of the EA (2009-2010). In March 2010, a final Biological Assessment was submitted to USFWS and NMFS. Letters of concurrence were received from USFWS (April 14, 2010) and NFMS (March 30, 2010) concurring with the determinations in the Biological Assessment. No conservation measures were issued. During development of this FEIS, it was determined that no additional consultation was required as only minor changes were made to the proposed action, mostly being more conservative (i.e. larger no-treatment buffers).

Northern Spotted Owl

Endangered Species Act (ESA) formal consultation with the USFWS for the Northern Spotted Owl was completed in 2009 and evaluated by the USFWS in the 2009 Biological Opinion (FWS reference 13420-2010-F-0001) signed November 25, 2009. Subsequently, Critical Habitat for the northern spotted owl was modified with the 2012 Critical Habitat Rule. This resulted in reinitiation of consultation and an additional Biological Opinion (FWS Reference Number 01EOFW00-2013-F-0115) that addressed the effects to 2012 Critical Habitat for activities proposed by the Goose project. USFWS issued the additional Biological Opinion on April 22, 2013.

U.S. Environmental Protection Agency (EPA)

During project scoping, the EPA submitted a list of recommendations for analysis and project design. This letter was reviewed and recommendations incorporated as appropriate. Per Forest Service regulations, this FEIS will be filed with the EPA's Office of Federal Activities in Washington, DC, who will publish a notice of availability in the Federal Register.

Oregon State Historic Preservation Office

The 1995 Programmatic Agreement (PA) among the USDA Forest Service PNW, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer (SHPO) Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service, (amended in 2004), provides a process by which the Forest Heritage Specialist may certify that the Forest has complied with Section 106 of NHPA for the project. In accordance with this PA, an appropriate inventory was conducted in July 2009. All known cultural sites in the Area of Potential Effect (project area) were protected by avoidance, resulting in a determination of "No Historic Properties Affected" on November 19, 2014. Documentation was provided by SHPO and copies have been retained in the Forest and District Heritage files.

Oregon State Parks and Recreation Department

Segments of the McKenzie River are designated Oregon State Scenic Waterway, which is administered by the Oregon State Parks and Recreation Department. The State Scenic Waterway segments have a dual classification, with the west side of the McKenzie River classified as Scenic River Area and the east side of the river classified as Recreation River Area. Scenic Waterway Act and Commission rules require the evaluation of proposed development within ¼ mile from each side of the river. Approval for timber harvest or salvage within this scenic waterway was requested May 29, 2012 and granted by Oregon State Parks and Recreation on September 28, 2012.

1.9 Issues Derived from Public Comments

A standardized content analysis process was conducted to analyze the letters received during the public scoping comment period. Content analysis was designed to extract comments from each letter received, evaluate similar comments from different letters, and identify topics or issues of concern. During content analysis, the Interdisciplinary Team (IDT), with involvement and approval from the Responsible Official, identified issues and separated them into three categories: "key" issues, "other" issues, and "out of scope" issues.

Key Issues

Key issues represent an unresolved conflict associated with potential environmental effects of the proposed action that cannot be resolved simply with mitigation or design features. Key issues are used to formulate alternatives and focus the analysis of environmental effects.

During the public scoping process, three key issues were identified from comments and questions:

> ***Key Issue #1:*** Harvest treatments and underburning should not occur in fire-regenerated stands (i.e. naturally regenerated stands)
>
> ***Key Issue #2:*** Harvest treatments should not occur in stands over 80 years of age
>
> ***Key Issue #3:*** No regeneration harvest (Shelterwood with Reserves) should occur

In response to these issues, Alternative 3 was developed, which eliminates harvest or underburning in fire-regenerated stands, harvest in stands over 80 years of age, and regeneration harvest. WUI treatments, other than underburning, would still occur in fire-regenerated stands and stands over 80 years of age. Though three issues are listed above, only one measure of change will be used to compare the alternatives:

> ***Key Issue Measurement:*** Acres of fire-regenerated stands treated

Stands over 80 years of age in the project area are fire-regenerated stands, as are stands proposed for regeneration harvest. Therefore, measuring acres of fire-regenerated stands treated will encompass the stands over 80 years of age and those proposed for regeneration harvest.

Other Issues and Out of Scope Issues

Other issues are minor issues that do not result in development of alternatives or focus the analysis of environmental effects. In most cases, the IDT is able to address these issues by refining the design of a project (i.e. dropping a unit from the project) or applying a design feature (i.e. requiring buffers around streams).

Out of Scope issues are those identified as being "out of scope" of this environmental analysis. These issues include those that are not or cannot be addressed or solved in this project-level analysis; issues already decided by law, regulation, or other higher level decisions; issues irrelevant to the decision being made; and/or issues that are conjectural or not supported by scientific evidence.

1.10 Decision Framework

The responsible official for this proposal is the District Ranger of the McKenzie River Ranger District on the Willamette National Forest. The District Ranger will review the proposed action, alternatives, and the environmental consequences in order to make the following decisions:

- Whether to implement the proposed action or another alternative;
- What specific design features are needed;
- What specific project monitoring requirements are needed to ensure design features are implemented and effective; and
- What if any modifications would be made to the proposed action.

The decision will be based on:

- How well the selected alternative achieves the project purpose and need; and
- How well the selected alternative responds to analysis issues.

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Chapter 2 - Alternatives

This chapter describes and compares the alternatives considered for the Goose project. It includes a description and map of each alternative considered. This chapter also presents the alternatives in comparative form, defining the differences between each alternative in order to provide a clear basis for choice by the decision maker.

Three alternatives have been analyzed for this project: Alternative 1 - No-Action; Alternative 2 - Proposed Action; and Alternative 3 - No Harvest or Underburn in Fire Regenerated Stands.

2.1 Alternative 1 – No Action

Alternative 1- No-Action assesses the current management situation of the affected environment as well as the future conditions should an action not be implemented. The No-Action alternative should not be confused with a baseline. Whereas a baseline is essentially a description of the affected environment at a fixed point in time, the No-Action alternative considers what effects would occur to forest ecosystems and resources in the project area if no action is taken.

The purpose and need of the proposed action would not be met under Alternative 1, as no timber harvest or fuels treatments would be implemented.

2.2 Alternative 2 – Proposed Action

Alternative 2 is the proposed action and was developed to fully meet the purpose and need for this project. Alternative 2 proposes to treat approximately 2,452 acres in the project area (Figure 6 and 7). Harvest treatments proposed include thinning, gap creation, dominant tree release, regeneration harvest, and skips. Harvest treatments would yield approximately 35 million board feet of timber. Post-harvest fuels treatments would include pile and burn and post-harvest underburn. Wildland-Urban Interface (WUI) fuels treatments would include natural fuels underburn and hazardous fuels treatments. Approximately 6.9 miles of temporary road construction would occur and approximately 43 miles of existing road would be maintained under Alternative 2.

Table 6 includes a summary of treatments and connected actions proposed under Alternative 2. A detailed description of proposed treatments and project activities is included in Appendix A. A detailed list of treatments for individual units is listed in Appendix B.

Table 6. Summary of Proposed Treatments and Connected Actions –Alternative 2

Proposed Activity	Unit of Measure	Alternative 2	Purpose – Need Addressed[4]
Timber Harvest Treatments			
Thinning outside Riparian Reserves	Acres	1, 080	1, 2, 3
Thinning in Riparian Reserves	Acres	138	3
Regeneration Harvest	Acres	43	1,3
Gaps	Acres	281	1, 2, 3
Dominant Tree Release	Acres	50	1, 3

Proposed Activity	Unit of Measure	Alternative 2	Purpose – Need Addressed[4]
Skips outside Riparian Reserves	Acres	173	3
Skips in Riparian Reserves	Acres	291	3
Total	**Acres**	**2,056**	-
Estimated Volume	**MMBF**	**~35**	**1**
WUI Fuels Treatments – No Timber Harvest			
Natural Fuels Underburn outside Riparian Reserves	Acres	33	2, 3
Natural Fuels Underburn in Riparian Reserves	Acres	0	3
Hazardous Fuels Treatment outside Riparian Reserves	Acres	189	2, 3
Hazardous Fuels Treatment in Riparian Reserves	Acres	136	2, 3
Skips (associated with WUI)	Acres	38	2, 3
Total WUI Fuels Treatment	**Acres**	**396**	
Post-Harvest Fuels Treatments[1] in Timber Harvest Units			
Pile and Burn (mechanical and/or hand treatments)[2]	Acres	624	2
Post-Harvest Underburn [3]	Acres	477	2, 3
Connected Actions			
Harvest System			
Helicopter	Acres	215	-
Skyline	Acres	582	-
Ground	Acres	795	-
Transportation			
Temporary Roads	Miles	6.9	-
Road Maintenance/Haul Route	Miles	43	-
Post-Harvest Planting			
Planting in Regeneration Harvest	Acres	~43	3
Planting in Gaps	Acres	~77	3
Natural Regeneration in Gaps	Acres	~204	3
Other			

Proposed Activity	Unit of Measure	Alternative 2	Purpose – Need Addressed[4]
• **Subsoiling:** Subsoiling would occur in harvest units where needed to keep compaction below Forest Standards and Guidelines for high compaction levels. Subsoiling would also occur on skid roads located in regeneration harvest units and gaps. • **Temporary Road Decommissioning:** Temporary roads in the project area would be decommissioned upon completion of activities or connected activities such as firewood gathering. • **Scarifying Temporary Roads:** Soils may be scarified to aid in vegetation establishment. • **Down Wood and Snag:** At least 240 lineal feet per acre of decay class I and II material greater than 20" diameter and 20 feet in length would be retained within the regeneration harvest units. Where the preferred size of material is not available, 240 lineal feet per acre of the next largest trees proposed to be harvested would be left. On average 4 snags (or live trees for snag creation) per acre would also be left in the regeneration harvest units.			

[1]: Post-harvest fuels treatments methods may change depending on feasibility and funding. Post-harvest fuels treatments would occur in timber harvest units; therefore the acreage of post-harvest fuels treatments are not included in the total acres of treated units.
[2]: Mechanical treatment may include: grapple piling in slash concentrations, yarding tops attached, mastication, or any other mechanical device).
[3]: These acres are possible underburn acres due to dbh and location, not all acreage may be underburned. Acreage not underburned may have other post-harvest fuels treatments assigned before implementation.
[4]: 1- Provide a sustainable supply of timber products; 2- Reduce hazardous fuel in the McKenzie Bridge Wildland-Urban Interface (WUI); and 3- Actively manage stands to improve stand conditions, diversity, density, and/or structure.

Harvest treatments would occur in stands ranging from 27-127 years old. Approximately 342 harvest acres are in stands over 80 years old and 1,250 harvest acres are in stands under 80 years old. Fuels treatments would occur in stands ranging from 39-394 years old. Table 7 provides a summary of forest age classes and treatment acres for Alternative 2.

Table 7. Summary of Forest Age Classes and Treatment Acres – Alternative 2

	<80 years old	80-120 years old	>120 years old
Acres of Harvest Units (including skips)	1537	456	63
Acres Proposed for Harvest	1250	300	42
WUI Treatment Acres (including skips)	6	0	390

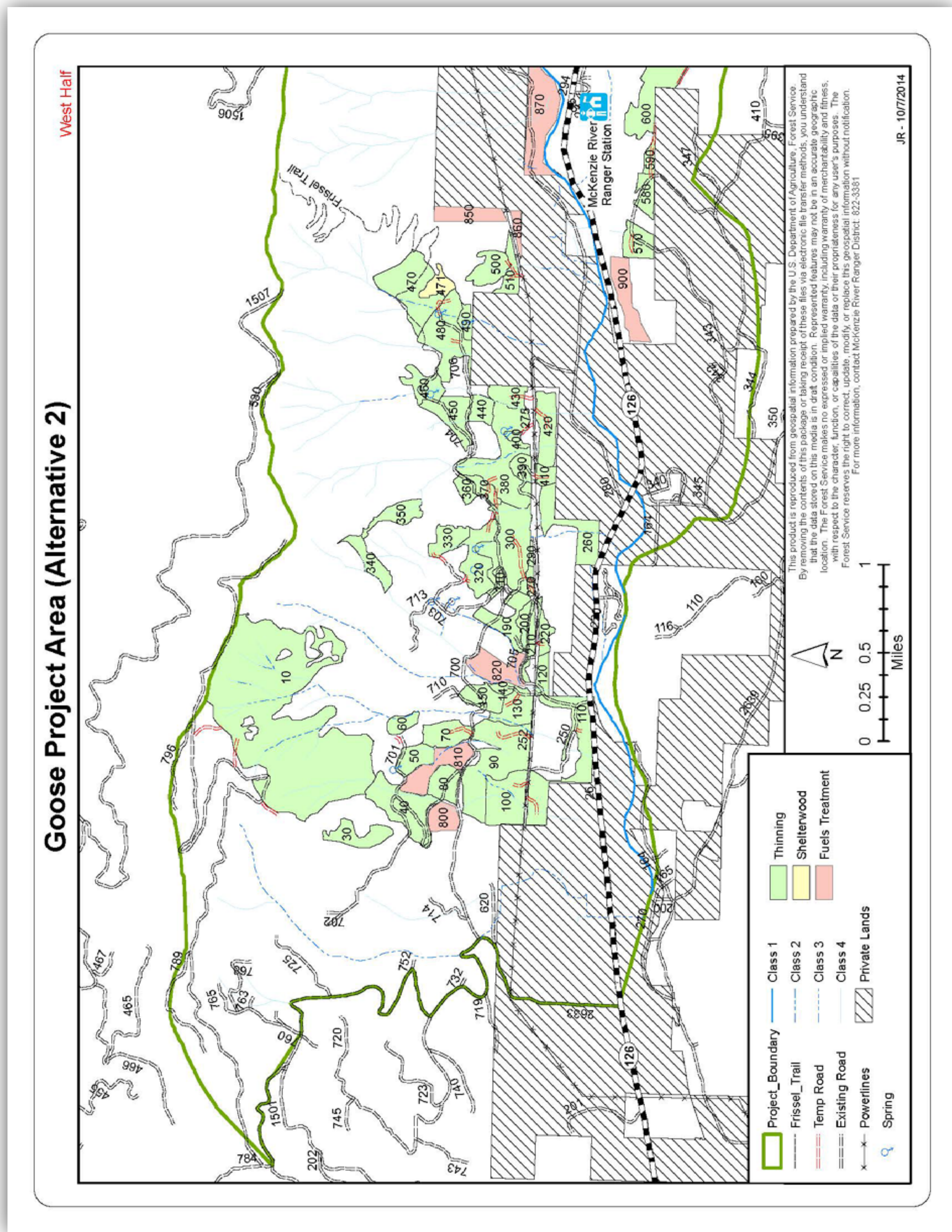

Figure 6. Map of Alternative 2 (West Half)

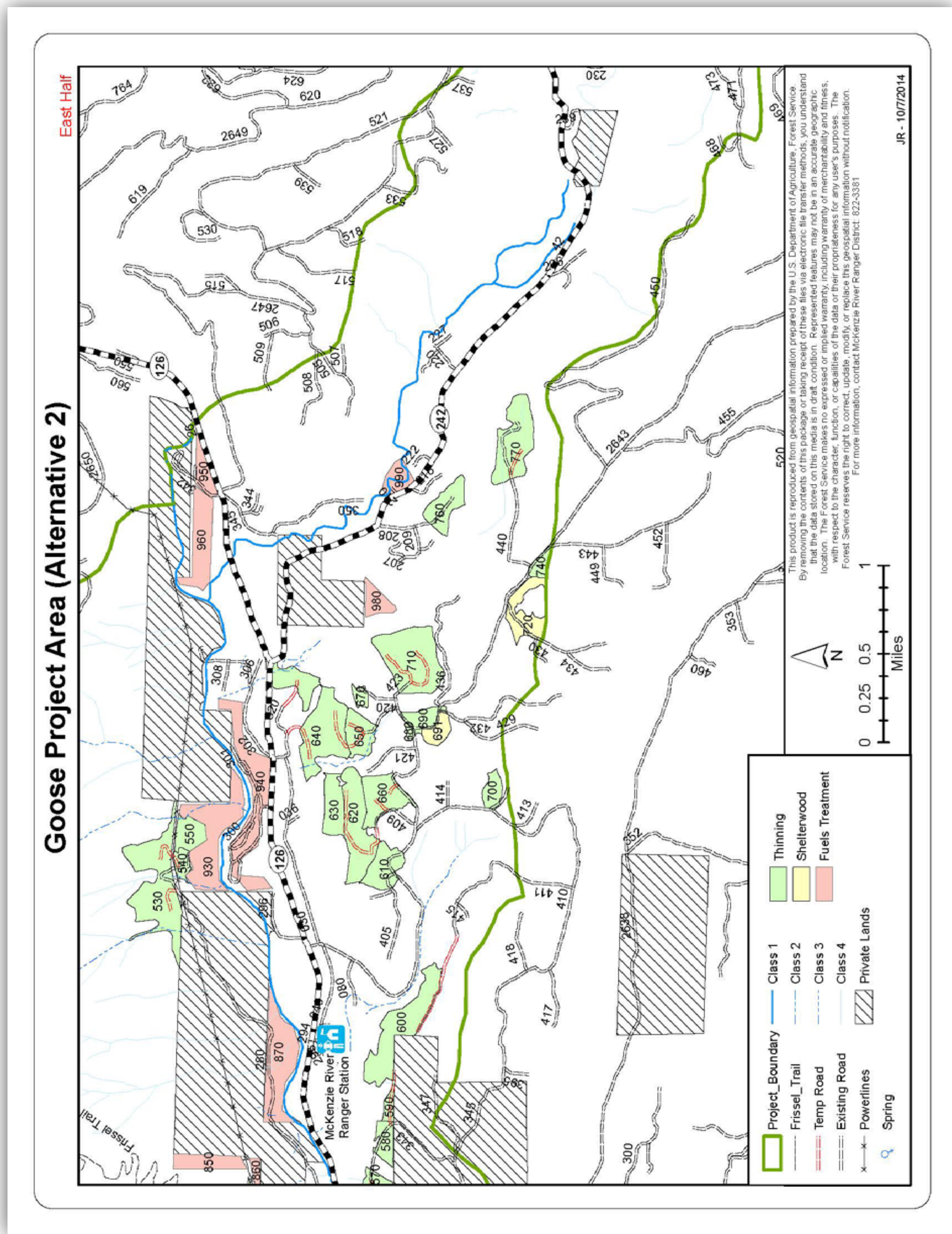

Figure 7. Map of Alternative 2 (East Half)

2.3 Alternative 3 – No Harvest or Underburn in Fire Regenerated Stands

During the EIS scoping process, three key issues were identified from comments and questions:

> ***Key Issue #1:*** Harvest treatments and underburning should not occur in fire-regenerated stands (i.e. naturally regenerated stands)
>
> ***Key Issue #2:*** Harvest treatments should not occur in stands over 80 years of age
>
> ***Key Issue #3:*** No regeneration harvest (Shelterwood with Reserves) should occur

In response to these issues, Alternative 3 was developed, which eliminates harvest and underburning in fire-regenerated stands; harvest in stands over 80 years of age; and regeneration harvest. Stands over 80 years of age in the project area are fire-regenerated stands, as are stands proposed for regeneration harvest. Therefore, measuring acres of fire-regenerated stands treated will encompass the stands over 80 years of age and those proposed for regeneration harvest. WUI treatments would still occur in fire-regenerated stands and stands over 80 years of age.

Alternative 3 proposes to treat approximately 1,069 acres in the project area (Figure 8 and 9). Harvest treatments proposed include thinning, gap creation, dominant tree release, and skips. Harvest treatments would yield approximately 9 million board feet of timber. Post-harvest fuels treatments would include pile and burn and post-harvest underburn. Wildland-Urban Interface (WUI) fuels treatments would include natural fuels underburn and hazardous fuels treatments. Approximately 2.2 miles of temporary road construction would occur and approximately 26 miles of existing road would be maintained under Alternative 3.

Because no harvest or underburning would occur in fire-regenerated stands under Alternative 3, proposed acres for harvest treatment decrease by 1,312 acres from Alternative 2. Alternative 3 proposes 170 fewer acres of gap creation; 20 acres fewer of dominant tree release; 749 fewer acres of thinning; 330 fewer acres of skips; and 43 fewer acres of regeneration harvest than Alternative 2. Alternative 3 would reduce acres of post-harvest fuels treatments by 614 acres and reduce acres of WUI fuels treatments by 71 acres.

Table 8 includes a summary of treatments and connected actions proposed under Alternative 3. A detailed comparison of Alternative 2 and Alternative 3 is available in Section 2.4 – Comparison of Alternatives.

Table 8. Summary of Proposed Treatments and Connected Actions – Alternative 3

Proposed Activity	Unit of Measure	Alternative 3	Purpose – Need Addressed[4]
Timber Harvest Treatments			
Thinning outside Riparian Reserves	Acres	412	1, 2, 3
Thinning in Riparian Reserves	Acres	57	3
Regeneration Harvest	Acres	0	-
Gaps	Acres	111	1, 2, 3
Dominant Tree Release	Acres	30	1, 3
Skips outside Riparian Reserves	Acres	45	3

Proposed Activity	Unit of Measure	Alternative 3	Purpose – Need Addressed[4]
Skips in Riparian Reserves	Acres	89	3
Total	**Acres**	**744**	-
Estimated Volume	**MMBF**	**~9**	**1**
WUI Fuels Treatments – No Timber Harvest			
Natural Fuels Underburn outside Riparian Reserves	Acres	0	2, 3
Natural Fuels Underburn in Riparian Reserves	Acres	0	3
Hazardous Fuels Treatment outside Riparian Reserves	Acres	189	2, 3
Hazardous Fuels Treatment in Riparian Reserves	Acres	136	2, 3
Skips (associated with WUI)	Acres	0	2, 3
Total WUI Fuels Treatment	**Acres**	**325**	
Post-Harvest Fuels Treatments[1] in Timber Harvest Units			
Pile and Burn (mechanical and/or hand treatments)[2]	Acres	309	2
Post-Harvest Underburn [3]	Acres	178	2, 3
Connected Actions			
Harvest System			
Helicopter	Acres	0	-
Skyline	Acres	112	-
Ground	Acres	498	-
Transportation			
Temporary Roads	Miles	2.2	-
Road Maintenance/Haul Route	Miles	26	-
Post-Harvest Planting			
Planting in Regeneration Harvest	Acres	0	-
Planting in Gaps	Acres	~48	3
Natural Regeneration in Gaps	Acres	~63	3
Other			
• **Subsoiling:** Subsoiling would occur in harvest units where needed to keep compaction below Forest Standards and Guidelines for high compaction levels. Subsoiling would also occur on skid roads located in regeneration harvest units and gaps.			

- **Temporary Road Decommissioning:** Temporary roads in the project area would be decommissioned upon completion of activities or connected activities such as firewood gathering.
- **Scarifying Temporary Roads:** Soils may be scarified to aid in vegetation establishment.
- **Down Wood and Snag:** At least 240 lineal feet per acre of decay class I and II material greater than 20" diameter and 20 feet in length would be retained within the regeneration harvest units. Where the preferred size of material is not available, 240 lineal feet per acre of the next largest trees proposed to be harvested would be left. On average 4 snags (or live trees for snag creation) per acre would also be left in the regeneration harvest units.

[1]: Post-harvest fuels treatments methods may change depending on feasibility and funding. Post-harvest fuels treatments would occur in timber harvest units; therefore the acreage of post-harvest fuels treatments are not included in the total acres of treated units.
[2]: Mechanical treatment may include: grapple piling in slash concentrations, yarding tops attached, mastication, or any other mechanical device).
[3]: These acres are possible underburn acres due to dbh and location, not all acreage may be underburned. Acreage not underburned may have other post-harvest fuels treatments assigned before implementation.
[4]: 1- Provide a sustainable supply of timber products; 2- Reduce hazardous fuel in the McKenzie Bridge Wildland-Urban Interface (WUI); and 3- Actively manage stands to improve stand conditions, diversity, density, and/or structure.

Harvest treatments would occur in stands ranging from 27-63 years old. No harvest would occur in stands over 80 years old. Fuels treatments would occur in stands ranging from 39-394 years old. Table 9 provides a summary of forest age classes and treatment acres for Alternative 3.

Table 9. Summary of Forest Age Classes and Treatment Acres – Alternative 3

	<80 years old	80-120 years old	>120 years old
Acres of Harvest Units (including skips)	744	0	0
Acres Proposed for Harvest	610	0	0
WUI Treatment Acres (including skips)	6	0	319

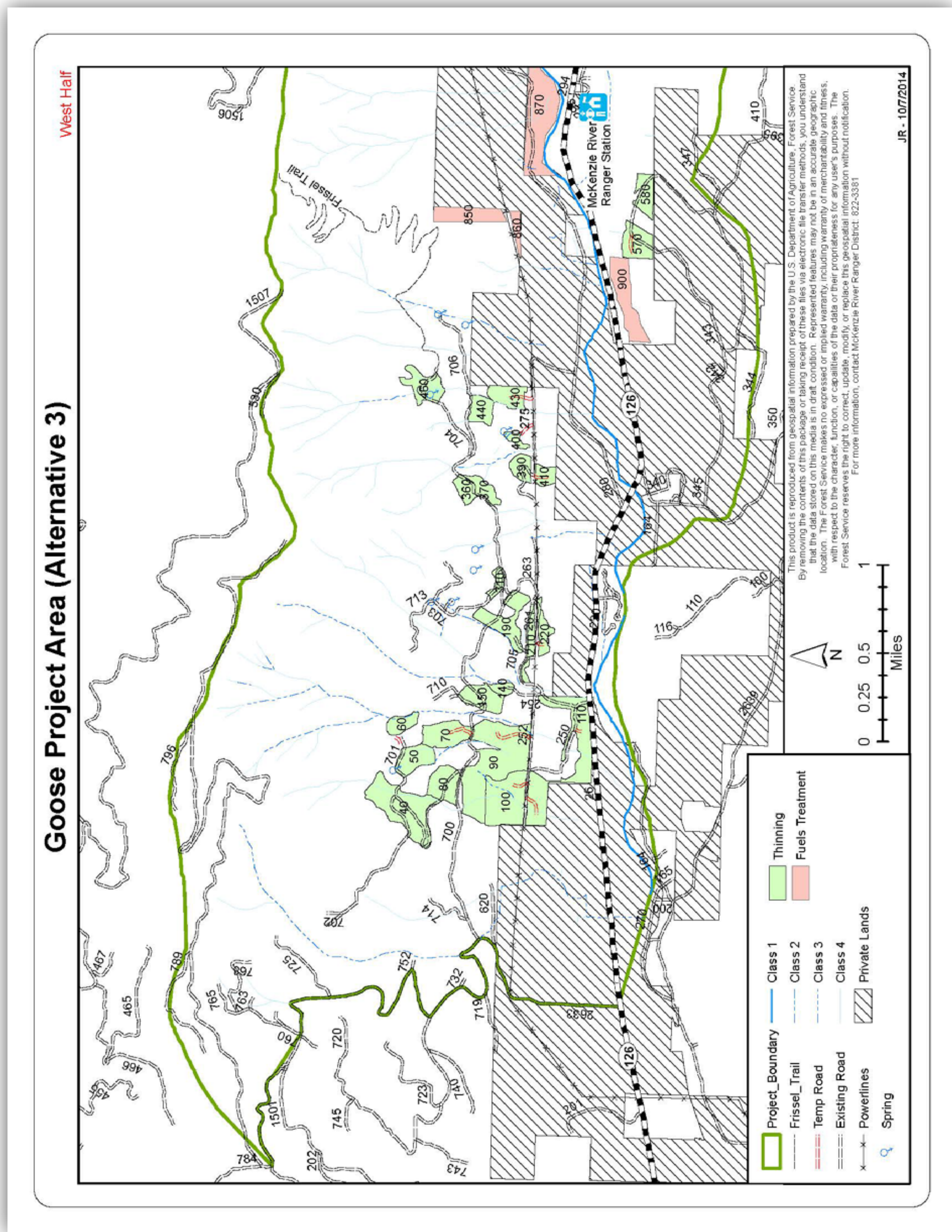

Figure 8. Map of Alternative 3 (West Half)

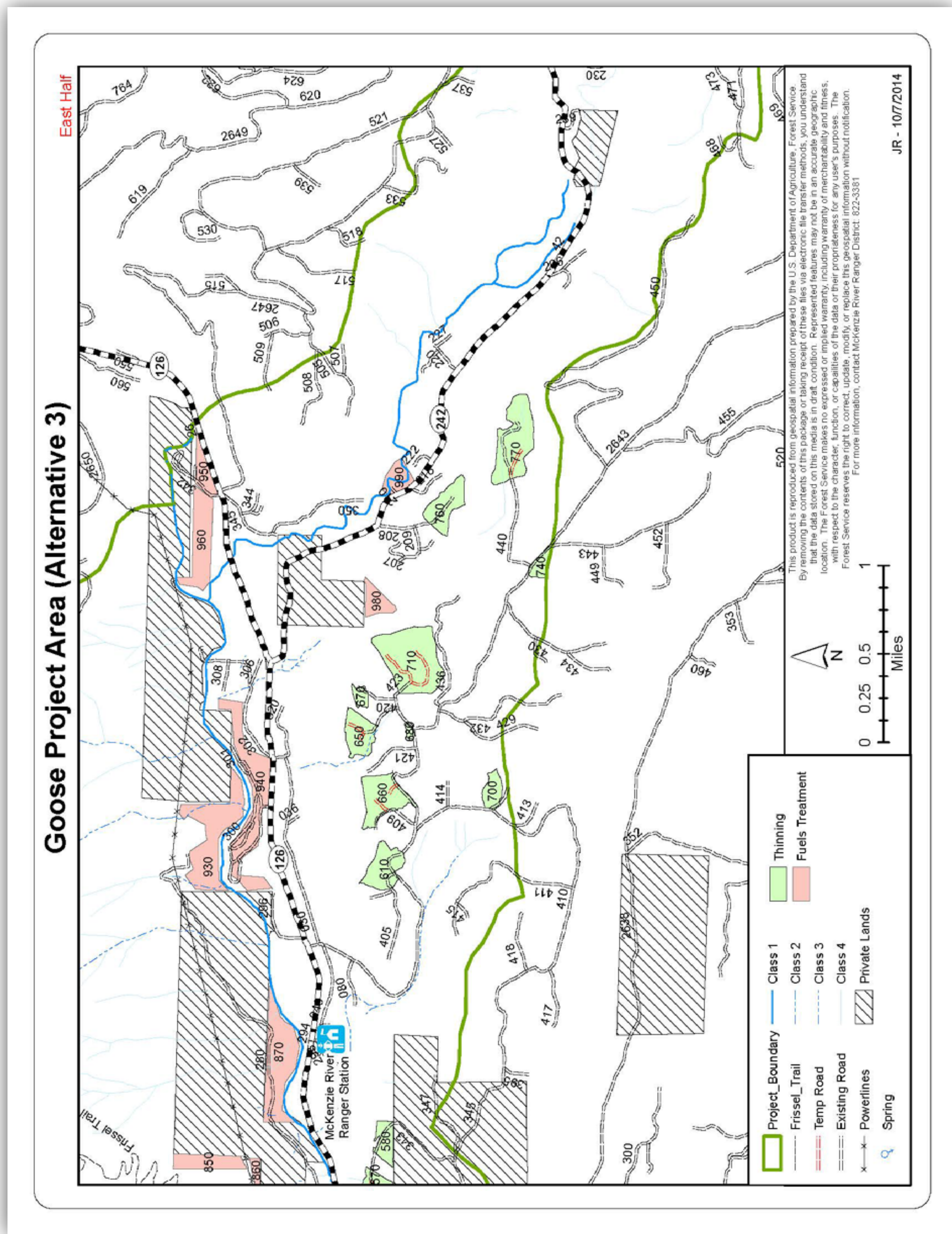

Figure 9. Map of Alternative 3 (East Half)

2.4 Comparison of Alternatives

Table 10 summarizes and compares treatments and connected actions that would occur under each alternative.

Table 10. Comparison of Alternatives

Proposed Activity	Unit of Measure	Alternative 1	Alternative 2	Alternative 3
Timber Harvest Treatments				
Thinning outside Riparian Reserves	Acres	0	1, 080	412
Thinning in Riparian Reserves	Acres	0	138	57
Regeneration Harvest	Acres	0	43	0
Gaps	Acres	0	281	111
Dominant Tree Release	Acres	0	50	30
Skips outside Riparian Reserves	Acres	0	173	45
Skips in Riparian Reserves	Acres	0	291	89
Total	**Acres**	**0**	**2,056**	**744**
Estimated Volume	**MMBF**	**0**	**~35**	**~9**
WUI Fuels Treatments – No Timber Harvest				
Natural Fuels Underburn outside Riparian Reserves	Acres	0	33	0
Natural Fuels Underburn in Riparian Reserves	Acres	0	0	0
Hazardous Fuels Treatment outside Riparian Reserves	Acres	0	189	189
Hazardous Fuels Treatment in Riparian Reserves	Acres	0	136	136
Skips (associated with WUI)	Acres	0	38	0
Total WUI Fuels Treatment	**Acres**	**0**	**396**	**325**
Post-Harvest Fuels Treatments[1] in Timber Harvest Units				
Pile and Burn (mechanical and/or hand treatments)[2]	Acres	0	624	309
Post-Harvest Underburn [3]	Acres	0	477	178
Connected Actions				
Harvest System				
Helicopter	Acres	0	215	0

Proposed Activity	Unit of Measure	Alternative 1	Alternative 2	Alternative 3
Skyline	Acres	0	582	112
Ground	Acres	0	795	498
Transportation				
Temporary Roads	Miles	0	6.9	2.2
Road Maintenance/Haul Route	Miles	0	43	26
Post-Harvest Planting				
Planting in Regeneration Harvest	Acres	0	~43	0
Planting in Gaps	Acres	0	~77	~48
Natural Regeneration in Gaps	Acres	0	~204	~63
Key Issues 1, 2, and 3				
Acres of treatment (harvest, skips, and gaps) in fire-regenerated stands	Acres	0	1,312	0
Natural fuels underburn (WUI) treatments in fire regenerated stands (includes skips)	Acres	0	60	0
Hazardous fuels (WUI) treatments in fire regenerated stands	Acres	0	325	325

[1]: Post-harvest fuels treatments methods may change depending on feasibility and funding. Post-harvest fuels treatments would occur in timber harvest units; therefore the acreage of post-harvest fuels treatments are not included in the total acres of treated units.
[2]: Mechanical treatment may include: grapple piling in slash concentrations, yarding tops attached, mastication, or any other mechanical device).
[3]: These acres are possible underburn acres due to dbh and location, not all acreage may be underburned. Acreage not underburned may have other post-harvest fuels treatments assigned before implementation.

Comparison of Treatments Proposed in Riparian Reserves for Alternative 2 and 3

The treatments proposed in Riparian Reserves for Alternative 2 and 3 are described and displayed below in Tables 11 and 12. All units were surveyed by fisheries, hydrology, wildlife, and botany specialists. Each unit was gridded to capture streams, springs, wetlands and other waterbodies that may not be mapped on the GIS layer. Based on stream and riparian characteristics, a recommendation was made for no-treatment buffers and other potential treatments (e.g., down wood creation) for each waterbody. After surveys were conducted individually, specialists met as a team to discuss findings and develop an integrated Riparian Reserve management plan for each unit. Due to differences in stand conditions, unit-specific management prescriptions are grouped into five treatment types:

Full Stream Influence Zone Protection: The stream influence zone is the extent of a stream's riparian area that directly influences stream function and is typically defined as one site potential tree height (172 feet in the Headwaters McKenzie River Watershed). The portions of these Riparian Reserves within the stream influence zone are currently functioning and meeting Aquatic Conservation Strategy (ACS) Objectives. Therefore, no management within one site potential tree height (172 feet) is recommended (except for Unit 380; see Table 11). Thinning in the upland portion of Riparian Reserves (172-344 feet) of ponds and fish-bearing streams, however, is recommended to improve vegetation species diversity and late forest structure for wildlife.

Thinning for Vegetation Diversity: Stands within these Riparian Reserves are overstocked, conifer-dominant, lacking structural and species diversity, and not currently meeting ACS Objectives. Thinning was recommended to improve vegetation conditions outside of the primary shade zone on perennial waterbodies to protect water quality and outside of the primary wood recruitment zone (discussed in detail in Section 3.4.3) to protect potential in-stream wood inputs. Thinning would accelerate development of large wood and late forest stand structure and increase species diversity, which would improve the ability of Riparian Reserves to provide adequate stream shade, root strength and bank stability, sediment filtration and nutrient cycling, large wood supply to waterbodies and floodplains, organic matter input, and habitat for riparian-dependent wildlife.

Dead and Down Wood Creation: Stands within these Riparian Reserves are overstocked, conifer-dominant, lacking structural and species diversity, and not currently meeting ACSOs. Near perennial waterbodies, thinning was recommended to improve vegetation conditions outside of the primary shade zone to protect water quality and outside of the primary wood recruitment zone to protect potential in-stream wood inputs. On intermittent streams and springs, thinning was recommended within the primary wood recruitment zone to improve vegetation diversity but dead and down wood objectives would be met by falling and leaving at least eight trees per acre and creating two snags per acre.

Natural Fuels Underburn*:* These late-seral Riparian Reserves are currently functioning and meeting ACSOs. Therefore, no underburning within Riparian Reserves is recommended.

Hazardous Fuels Treatment: The near-stream portions of these late-seral Riparian Reserves are currently functioning and meeting ACSOs. Therefore, no management within one site potential tree height (172 feet) is recommended. Non-commercial thinning of trees and shrubs <10" in diameter in the upland portion (172-344 feet), however, is recommended to reduce hazardous fuels in the Wildland-Urban Interface and risk of high severity fire.

For more information on how these management prescriptions comply with ACS Objectives, see Appendix E.

Table 11. Treatments Proposed in Riparian Reserves with Alternative 2

Description	Units	Stream Class	Riparian Reserve Boundary[1]	Thinning Treatment	Ground-Based Equipment Buffer[2]	Fuels Treatment Buffer[3]
Full Stream Influence Zone Protection No harvest within one site potential tree height of waterbody. Thinning in upland portion to improve vegetation diversity for wildlife.	90, 100, 130, 200, 260, 300, 380, 420, 440, 450, 470, 480, 490,	Fish-bearing Streams (Class 1 & 2)	344 feet	No harvest within 172'; >50% canopy closure from 172'-344'	172 feet	No fuels treatment or underburn within 172'
		Perennial Non Fish-bearing Streams (Class 3)	172 feet	No harvest within 172'	172 feet	No fuels treatment or underburn within 172'
		Intermittent Streams (Class 4)	172 feet	No harvest within 172'	172 feet	No fuels treatment or underburn within 172'

Description	Units	Stream Class	Riparian Reserve Boundary[1]	Thinning Treatment	Ground-Based Equipment Buffer[2]	Fuels Treatment Buffer[3]
	500, 520, 530, 570	Ponds	344 feet	No harvest within 172'; >50% canopy closure from 172'-344'	172 feet	No fuels treatment or underburn within 172'
		Wetlands and Springs	172 feet	No harvest within 172'	172 feet	No fuels treatment or underburn within 172'
				Unit 380 only: No harvest within 60' to improve elk forage closer to wetland; >50% canopy closure from 60'-172'	110 feet	No fuels treatment or underburn within 60'
Thinning for Vegetation Diversity Thinning to improve vegetation diversity for wildlife while protecting shade and wood recruitment zones.	10, 40, 50, 60, 80, 110, 120, 140, 150, 190, 210, 370, 390, 400, 430, 460, 510, 540, 550*, 590, 600, 640, 650, 660, 710, 770	Fish-bearing Streams (Class 1 & 2)	344 feet	No harvest within 172'; >50% canopy closure from 172'-344'	172 feet	No fuels treatment or underburn within 172'
				Unit 550 only: No harvest within 90'; >50% canopy closure from 90'-344'	140 feet	No fuels treatment or underburn within 90'
		Perennial Non Fish-bearing Streams (Class 3)	172 feet	No harvest within 60'; >50% canopy closure from 60'-172'	110 feet	No fuels treatment or underburn within 60'
		Intermittent Streams (Class 4)	172 feet	No harvest within 30'; >50% canopy closure from 30'-172'	80 feet	No fuels treatment or underburn within 60'
				Unit 390 only: No harvest within 60' to account for larger wood recruitment zone; >50% canopy closure from 60'-172'	110 feet	No fuels treatment or underburn within 60'
		Ponds	344 feet	No harvest within 60'; >50% canopy closure from 60'-344'	110 feet	No fuels treatment or underburn within 60'
		Wetlands and Springs	172 feet	No harvest within 30'; >50% canopy closure from 30'-172'	80 feet	No fuels treatment or underburn within 60'
				Unit 400 only: No harvest within 60' for shade protection on perennial spring; >50% canopy closure from 60'-172'	110 feet	No fuels treatment or underburn within 60'

Description	Units	Stream Class	Riparian Reserve Boundary[1]	Thinning Treatment	Ground-Based Equipment Buffer[2]	Fuels Treatment Buffer[3]
Dead and Down Wood Creation Thinning to improve vegetation diversity for wildlife while increasing dead and down wood abundance.	70, 320, 330, 340, 350	Perennial Non Fish-bearing Streams (Class 3)	172 feet	No harvest within 60'; >50% canopy closure from 60'-172'; down wood creation of >8 per acre and 2 snags per acre within RR	110 feet	No fuels treatment or underburn within 60'
		Intermittent Streams (Class 4)	172 feet	No harvest within 30'; >50% canopy closure from 30'-172'; down wood creation of >8 per acre and 2 snags per acre within RR	80 feet	No fuels treatment or underburn within 60'
		Wetlands and Springs	172 feet	No harvest within 30'; >50% canopy closure from 30'-172'; down wood creation of >8 per acre and 2 snags per acre within RR	80 feet	No fuels treatment or underburn within 60'
Natural Fuels Underburn Low to moderate burning to reintroduce fire as a natural disturbance process, improve habitat for wildlife, and to reduce hazardous fuels in the Wildland-Urban Interface.	800, 810, 820	Perennial Non Fish-bearing Streams (Class 3)	172 feet	N/A	N/A	No underburn within 172'
		Intermittent Streams (Class 4)	172 feet	N/A	N/A	No underburn within 172'
Hazardous Fuels Treatments Non-commercial thinning of trees and shrubs <10" diameter to reduce hazardous fuels in the Wildland-Urban Interface and risk of high severity fire.	870, 930, 940, 950, 960, 990	Fish-bearing Streams (Class 1 & 2)	344 feet	N/A	172 feet	No fuels treatment within 172'
		Perennial Non Fish-bearing Streams (Class 3)	172 feet	N/A	172 feet	No fuels treatment within 172'
		Intermittent Streams (Class 4)	172 feet	N/A	172 feet	No fuels treatment within 172'
		Ponds	344 feet	N/A	172 feet	No fuels treatment within 172'

[1] One site potential tree height is 172' as identified in the Upper McKenzie Watershed Analysis.
[2] No ground-based equipment within 50 feet of no-harvest buffer. For units with 172' no-harvest buffer, the equipment buffer is the same.
[3] In addition to fuels treatment buffer, there would be no fireline construction within Riparian Reserves.

Table 12. Treatments Proposed in Riparian Reserves with Alternative 3

Description	Units	Stream Class	Riparian Reserve Boundary[1]	Thinning Treatment	Ground-Based Equipment Buffer[2]	Fuels Treatment Buffer[3]
Full Stream Influence Zone Protection No harvest within one site potential tree height of waterbody. Thinning in upland portion to improve vegetation diversity for wildlife.	90, 100, 440, 570	Fish-bearing Streams (Class 1 & 2)	344 feet	No harvest within 172'; >50% canopy closure from 172'-344'	172 feet	No fuels treatment or underburn within 172'
		Perennial Non Fish-bearing Streams (Class 3)	172 feet	No harvest within 172'	172 feet	No fuels treatment or underburn within 172'
		Intermittent Streams (Class 4)	172 feet	No harvest within 172'	172 feet	No fuels treatment or underburn within 172'
		Ponds	344 feet	No harvest within 172'; >50% canopy closure from 172'-344'	172 feet	No fuels treatment or underburn within 172'
		Wetlands and Springs	172 feet	No harvest within 172'	172 feet	No fuels treatment or underburn within 172'
Thinning for Vegetation Diversity Thinning to improve vegetation diversity for wildlife while protecting shade and wood recruitment zones.	40, 50, 60, 80, 110, 140, 150, 190, 210, 370, 390, 400, 430, 460, 650, 660, 710, 770	Fish-bearing Streams (Class 1 & 2)	344 feet	No harvest within 172'; >50% canopy closure from 172'-344'	172 feet	No fuels treatment or underburn within 172'
		Perennial Non Fish-bearing Streams (Class 3)	172 feet	No harvest within 60'; >50% canopy closure from 60'-172'	110 feet	No fuels treatment or underburn within 60'
		Intermittent Streams (Class 4)	172 feet	No harvest within 30'; >50% canopy closure from 30'-172'	80 feet	No fuels treatment or underburn within 60'
				Unit 390 only: No harvest within 60' to account for larger wood recruitment zone; >50% canopy closure from 60'-172'	110 feet	No fuels treatment or underburn within 60'
		Ponds	344 feet	No harvest within 60'; >50% canopy closure from 60'-344'	110 feet	No fuels treatment or underburn within 60'
		Wetlands and Springs	172 feet	No harvest within 30'; >50% canopy closure from 30'-172'	80 feet	No fuels treatment or underburn within 60'
				Unit 400 only: No harvest within 60' to account for larger wood recruitment zone; >50% canopy closure from 60'-172'	110 feet	No fuels treatment or underburn within 60'

Description	Units	Stream Class	Riparian Reserve Boundary[1]	Thinning Treatment	Ground-Based Equipment Buffer[2]	Fuels Treatment Buffer[3]
Dead and Down Wood Creation Thinning to improve vegetation diversity for wildlife while increasing dead and down wood abundance.	70	Perennial Non Fish-bearing Streams (Class 3)	172 feet	No harvest within 60'; >50% canopy closure from 60'-172'; down wood creation of >8 per acre and 2 snags per acre within RR	110 feet	No fuels treatment or underburn within 60'
		Intermittent Streams (Class 4)	172 feet	No harvest within 30'; >50% canopy closure from 30'-172'; down wood creation of >8 per acre and 2 snags per acre within RR	80 feet	No fuels treatment or underburn within 60'
Hazardous Fuels Treatments Non-commercial thinning of trees and shrubs <10" diameter to reduce hazardous fuels in the Wildland-Urban Interface and risk of high severity fire.	870, 930, 940, 950, 960, 990	Fish-bearing Streams (Class 1 & 2)	344 feet	N/A	172 feet	No fuels treatment within 172'
		Perennial Non Fish-bearing Streams (Class 3)	172 feet	N/A	172 feet	No fuels treatment within 172'
		Intermittent Streams (Class 4)	172 feet	N/A	172 feet	No fuels treatment within 172'
		Ponds	344 feet	N/A	172 feet	No fuels treatment within 172'

[1] One site potential tree height is 172' as identified in the Upper McKenzie Watershed Analysis

[2] No ground-based equipment within 50 feet of no-harvest buffer. For units with 172' no-harvest buffer, the equipment buffer is the same.

[3] In addition to fuels treatment buffer, there would be no fireline construction within Riparian Reserves.

2.5 Project Design Features Common to Alternatives 2 and 3

The design features in Table 13 were developed to reduce the environmental effects of the proposed activities and ensure project activities are implemented to comply with standards and guidelines, goals, objectives, conservation strategies and Best Management Practices.

Table 13. Design Features Common to Alternatives 2 and 3

	Objective	Design Feature	Location
	Forest and Stand Structure		
1	Meet stocking requirements as identified in the National Forest Management Act (NFMA) planting would be used in addition to natural regeneration to ensure full stocking	Plant at 15’ x 15’ spacing, or about 194 trees per acre. The species mix should contain Douglas-fir, western white pine, sugar pine, and western red cedar. Stratify the mix with Douglas-fir quantities higher in the lower elevations and western red cedar higher in the moister sites. Sugar pine and western red cedar would vary with sugar pine	All harvest units where planting is to occur (Refer to Appendix B)

	Objective	Design Feature	Location
		more prominent in warmer drier sites.	
2	Maintain structural diversity	During presale, protect identified trees with raptor nests and those with unusual structure such as broken tops.	All harvest units
3	Minimize damage during harvest.	Protect residual stand and reserve trees to the best extent possible from treatment damage.	All harvest units
	Fire and Fuels		
4	Reduce post-harvest fuels	Follow Forest Plan Standards and Guidelines for prescribed burning (FW-252).	All harvest units
5	Maintain effective ground cover and downed wood following fuels treatments	Follow Forest Plan Standards and Guidelines for prescribed burning (FW-081 and FW-253).	All harvest units
6	Identify management objectives from the Forest Plan related to fuels, prescription parameters, contingency, safety hazards and mitigations, and public notification prior to and during implementation.	Use the nationally approved Interagency Prescribed Fire Burn Plan for any activity involving prescribed fire.	All harvest units
7	Maintain forest structure and wildlife objectives	Follow burn prescription parameters so overstory mortality should not exceed 10 percent.	Underburn units
8	Maintain forest structure and wildlife objectives	At least two unburned slash piles per acre should be left for wildlife habitat. The average size of piles would be less than 6 feet tall and between 5 and 7 feet in diameter.	Units with slash pile creation
	Soils, Watershed and Fisheries		
9	Reduce compaction and undesirable soil damage	Existing landings, , old primary skid roads, previously compacted areas from legacy haul roads, and/or tractor fire lines would be utilized as much as possible prior to disturbing new areas.	All harvest units
10	Minimize erosion and sedimentation	Construction or maintenance of roads would not be done when soils are saturated or run-off occurs. A stable fill would be constructed across all streams when crossed by new temporary roads and would be removed following operations.	All harvest units
11	Minimize erosion and sedimentation	Native surfaced roads would be restricted from haul when soils are saturated or show signs of run-off.	All harvest units
12	Minimize potential impacts to fish.	Best Management Practices (BMP's), including placement of sediment barriers, provision of flow bypass, and other applicable measures, would be included in project design as necessary to control off-site movement of sediment.	Entire project area
13	Minimize potential impacts to fish.	Any project activity, such as culvert replacement, that must occur within fish-bearing streams would	Entire project area (July 1st-August 15th)

	Objective	Design Feature	Location
		comply with Oregon Department of Fish and Wildlife (ODFW) seasonal restrictions on in-stream work activities (July 1st – August 15th). If a waiver to these dates is required, the district fisheries biologist would need to review the proposal and seek a waiver from ODFW, NMFS, and the USFWS if it is warranted.	
14	Prevent sedimentation	All haul roads would be maintained in stable condition. Wet weather haul would be monitored by the Timber Sale Administrator, the District Road Manager, Fisheries Biologist, and/or Hydrologist. When necessary, haul may be suspended during rainfall to prevent off-site movement of sediment into drainage courses. Haul may occur when the road surface is either covered with a relatively continuous snow pack or frozen. Dust abatement of road surfaces would be used if roads become excessively dusty during the summer as determined by TSA.	All harvest units
15	Reduce contamination to aquatic areas	If lignin sulfate is used for dust abatement, one application would occur during the dry season (July/August/September) at a dilution rate of 50 percent lignin sulfate and 50 percent water. Lignosulfonate would remain on the road surface and not go over road edge. During blading, small berms could be created or wattles used at stream crossings to assist with keeping palliatives on the road surface. A 1 foot no-application buffer on the edge of gravel would be used if road width allows. Lignosulfonate would not be applied when raining and when possible, a 3 day forecast of clear weather would follow application.	All harvest units
16	Reduce off-site movement of sediment into drainage courses	Ground-based equipment used for yarding, processing, fuels treatment, or other project activities would operate only when soils are relatively dry or where water is not pooling. Over the snow operations may occur when there is a continuous snow pack at least 18 inches deep or when soils are sufficiently frozen to support equipment. Operations would be suspended before rainfall or precipitation results in off-site movement of sediment into drainage courses.	Ground based portions of harvest units
17	Undesirable soil damage from skidding would be avoided through skid trail layout and use of alternative yarding systems	Ground-based equipment should be limited to slopes less than 30 percent. Equipment use may be approved on slopes from 30-40 percent on short pitches based on site specific conditions. The upper limit for prebunching is on 45 percent slopes. All equipment trails need to be prelocated and preapproved. Skid trails would be located outside drainages, seeps, springs and/or concave landforms, which could accumulate and transport overland flow and sediment. Existing skid trails that are outside drainages, seeps and springs that meet the needs of the yarding system should be used wherever possible.	Ground based portions of harvest units

	Objective	Design Feature	Location
18	Reduce compaction directly adjacent to stream channels.	Ground-based equipment should not be permitted off road within 50 feet of class 1, 2, 3 or 4 no-cut stream buffers or to the edge of the Riparian Reserves whichever is closer.	Ground based portions of harvest units
19	Minimize impacts to stream channels.	Full suspension would be required when yarding over perennial stream channels. Where full suspension is not obtainable over intermittent streams (class 4), partial suspension would be required, and yarding would be limited to when the stream is dry. Bump logs to protect the stream channel would be utilized as appropriate	All harvest units
20	Minimize impacts to stream channels.	Where cable yarding requires corridors through a riparian area, corridors would be laid out to result in the least number of trees cut. Trees located within no-harvest riparian buffers that must be cut to facilitate yarding corridors would be felled towards the channel (if feasible) and left on site.	Cable yarding portions of harvest units
21	Provide adequate drainage and avoid unnecessary soil disturbance	All skid trails and landings should be water-barred to provide adequate drainage. Water bar location should occur where local terrain facilitates effective drainage of the skid trail or landing while avoiding unnecessary soil disturbance. Water bars should be keyed-in to the cut bank and have a clear outlet on the downhill side. Where available in concentrations, slash should be scattered on skyline corridors, skid trails and landings.	All harvest units
22	Reduce compaction	Primary skid trails would be sub-soiled to a depth of 3-6 inches at the completion of project activities. Primary skid trails in gaps, regeneration units, as well as all temporary roads and landings should be sub-soiled to a depth of 18-24 inches or to bedrock.	All harvest units except 100 and 410
23	Reduce compaction	All landings that have not been rocked, temporary haul, or primary skid roads utilized by the purchaser/logger should be sub-soiled to a depth of 18 to 24 inches or bedrock at the completion of logging activities. Additional post-harvest enhancement subsoiling is required in units approaching standard and guideline limits in additional compacted areas not utilized by the Purchaser.	Units 100 and 410
24	Prevent sedimentation	All areas of exposed soil, such as landings, skid trails, decommissioned roads, and cut and fill slopes associated with road construction or maintenance would be seeded with sterile seed, native grasses, or weed free mulch.	All harvest units
25	Prevent sedimentation	Sub-soiling and waterbaring may be limited or suspended on feller buncher/ processor/ forwarder roads when the skid road is sufficiently covered with slash to form an effective mat to minimize erosion.	All harvest units

	Objective	Design Feature	Location
26	Reduce soil disturbance and the risk of erosion in Riparian Reserves	Firelines for underburning would not be constructed within Riparian Reserves. Fire would only be allowed to back into the no-underburn buffers identified in the Riparian Reserve treatments tables.	All harvest units
27	Reestablish hydrologic and geologic processes	Temporary roads would be decommissioned after completion of project activities. Decommissioning of temporary roads would include all of the following as applicable: removal of any rock, blocking the entrance, removal of culverts, out-sloping the road surface, pulling back displaced material onto the road way, installation of water bars, re-vegetation of the road prism, and sub-soiling of compacted surfaces.	All harvest units
28	Protect key riparian features and integrity	All existing down wood would be retained within Riparian Reserves to maintain aquatic objectives.	All harvest units
29	Ensure sufficient water flow in streams	Water sources used by project operations would be reconstructed or maintained as necessary to protect stream bank stability, riparian vegetation, and water quality. Water used for fire treatments and dust abatement would be drafted from various water sources outside of Listed Fish Habitat. At all drafting locations, 90 percent of stream flow would be maintained to reduce risk to aquatic species and water quality.	Entire project area
30	Protect and enhance riparian features	Riparian Reserve treatments and buffers (see Table 11 and 12)	All harvest and WUI units
	Wildlife		
31	Provide downed wood and emulate residual material seen following wildfire	All existing down logs regardless of decay class would be retained on site	All Harvest Units
32	Provide downed wood and emulate material seen following a natural disturbance	Up to five trees per acre would be left after harvest to ensure a minimum of 240 linear feet of downed wood in decay classes 1 and 2[1]. Tree diameters would be of the average size merchantable trees within the unit. Full tree lengths are preferred. TSOs would work with purchasers to minimize disturbance of existing down wood See Table 15 for additional information.	Regeneration Units 471, 691, 720
33	Improve down wood habitat conditions within Riparian Reserves	Provide a minimum of 8 down trees per acre (post-harvest) of the average size merchantable tree selected thinned riparian reserve areas, decay Class 1-2. See Table 15 for additional information.	Riparian Reserve portions of Units 70, 320, 330, 340, and 350
34	Provide a visual screen along heavily travel roads to reduce impacts to game.	Where operable, limit skid trails entering roads and skyline corridors to a spacing of no less than 200 feet along roads.	Units adjacent to forest service roads 2600-700, and 2643
35	Provide a visual screen along heavily travelled roads to reduce	Within 50 foot, directionally fall away from the road to protect the non-merchantable trees and brushy	Units adjacent to forest service roads

	Objective	Design Feature	Location
	impacts to game.	hiding cover.	2600-700, and 2643
36	Enhance downed wood within the landscape	Up to 5 trees per acre, of the average size merchantable tree within the unit, may be fallen after harvest with site specific recommendation by the district wildlife biologist. See Table 15 for additional information.	All Thinning Units
37	Provide snags and emulate effects of mortality following a natural disturbance	Retain or create 5 large snags per acre after logging, of the average size merchantable tree Only decay Class 1-2 would count towards this total. Residual trees with diseases other than root rot may substitute for snag creation. One snag/acre would have “kerf cuts” in the trunk to provide habitat for roosting bats See Table 14 for additional information.	Regeneration Units
38	Improve snag habitat conditions within Riparian Reserves	Up to two trees per acre, of the average merchantable size within the unit, would be used for snag creation after harvest with site specific recommendation by the district wildlife biologist See Table 14 for additional information.	Riparian Reserve portions of Units 70, 320, 330, 340, and 350
39	Enhance snag levels within the landscape	Up to 5 trees per acre, of the average size within the unit, may be used for snag creation after harvest with site specific recommendation by the district wildlife biologist. See Table 14 for additional information.	All Thinning Units
40	Provide snags and emulate effects of mortality following fire	Retain existing snags where possible, except those needed to be fallen for safety or operational purposes. Those cut during operations should remain as down wood.	All Harvest Units
41	Provide downed wood within the landscape	Danger trees felled during operations would be left on site for large woody material.	All Harvest Units
42	Reduce impacts to bats	During layout, look for snags and trees that have cavities or sloughing bark that could be used as natal or roost sites by bats. If these are found, retain them, where possible, by incorporating them into skips or leave trees.	All Harvest Units
43	Reduce disturbance to nesting birds and during popular hunting periods	Snag creation activities would have seasonal restrictions applied as needed with a separate Biological Evaluation completed shortly before implementation. Implementation would not occur during general elk rifle season.	All harvest units with snag and/or large down wood placement and/ or enhancement
44	Reduce disturbance to nesting birds	When possible, conduct prescribed burning during the fall when conditions allow.	Units with underburn
45	Reduce disturbance during nesting season of cavity nesters	Conduct roadside hazard felling outside the critical seasonal restriction period for cavity nesters which is from April 1-June 30. This may be waived on a case-by-case basis if the trees to be felled are of small diameters and do not show signs of nesting use.	All roadside hazard tree maintenance

	Objective	Design Feature	Location
46	Reduce disturbance during critical nesting season of great gray owls	Restriction on falling trees, ground-based yarding, burning, and snag/large down wood enhancement from March 15-May 15.	Unit 740
47	Protect nesting osprey and their young	Restrict hazardous fuels treatment work from March 1-July 15.	Unit 990
48	Reduce disturbance during nesting season of northern spotted owls	Restriction on falling trees, ground-based yarding, burning, and helicopter yarding from March 1-July 15 is recommended.	Unit 10
49	Minimize effects to species of concern	If previously undocumented goshawk or other raptor nests are found during layout or sale administration, project modifications including contract modifications to remove acreage would be made as needed to protect the nest site and reduce harm to birds.	All harvest units
50	Maintain Johnson's Hairstreak (butterfly) habitat	Mark for retention any identified western hemlock trees which contain dwarf mistletoe	All harvest units
51	Protect habitat for the Crater Lake Tightcoil	Prevent ground/habitat disturbance within 10 meters (~30 feet) of perennially wet areas during project activities.	All harvest units
52	Minimize potential conflict between hunters and contractors	A seasonal operating restriction would restrict all operations behind closed gates during the Cascade Elk Rifle season, which is typically the third week of October. All non-emergency vehicle traffic would be restricted on gated closed roads beginning the Friday before that week through the end of the following Friday.	All harvest units
53	Protect any discovered Threatened, Endangered, or Sensitive (TES) species	If TES wildlife species are found in future field work or during activities associated with this project, and potential for adverse effects exists, project modifications would be pursued. All contracts would include provisions to provide required protection measures in the event of TES species discovery.	All harvest units
	Botany		
54	Reduce the introduction/spread of weeds	All road construction and logging equipment would be cleaned prior to entering working in the area.	Entire project area
55	Reduce the introduction/spread of weeds	Equipment should work in non-infested areas and then move to infested areas (USFS would provide map). If the purchaser elects to move from an infested area to a non-infested area, equipment shall be washed prior to leaving the infested area.	All harvest units
56	Reduce the introduction/spread of weeds	Clean fill (soil or rock free of slash and debris) would be used for construction of temporary roads. Sources of rock and fill material needs to be free of invasive plants. Rock quarries that may be used would be surveyed for invasive plants prior to use. If invasive plants are found, they would be treated as necessary prior to use.	All harvest units

	Objective	Design Feature	Location
57	Reduce the introduction/spread of weeds	Gaps would be placed to avoid infested areas (USFS would provide map).	All harvest units
58	Reduce the introduction of weeds	Use weed -free rock for all road construction and maintenance	Entire project area
59	Reduce area for weeds to germinate	Minimize soil disturbance (minimize fireline construction, reuse old skid roads) to meet project objectives.	All harvest units
60	Reduce the introduction of weeds	Disturbed areas (culverts, road shoulders, closed/obliterated roads, landings, skid trails) should be re-vegetated with weed free native seed to compete with invasive plants as soon as possible. Weed free mulch would be used if necessary. Monitor sites and reseed or replant as necessary.	Entire project area
61	Reduce the introduction of weeds	Roads to be closed or decommissioned would be treated for invasive plants prior to closing.	Entire project area
62	Protect known occurrences of survey and manage species	Buffers identified in Table 16 would be implemented. Presale would work with the district botanist.	Units identified in Table 16
63	Protect known special habitats	Buffers identified in Table 17 would be implemented. Presale would work with the district botanist.	Units identified in Table 17
64	Protect known special habitats and species associated with rock outcrops	Felling would be directional away from rock outcrop. No yarding across rock outcrop.	All harvest units
65	Reduce the potential for spread of invasive plants.	One or a combination of Integrated Pest Management practices (i.e. manual, mechanical, chemical, mulch) would be used to treat invasive plant species found in the project area. Existing infestations should be treated prior to project implementation to minimize seed spread.	All harvest units
66	Reduce the potential for spread of invasive plants	Minimize to the extent possible putting landings, yarding stations, staging and equipment storage areas, in weed infested areas. Provide timber and other contractors with a map of infestations in the pre-work process.	All harvest units
	Roads		
67	Protect against sediment	Best Management Practices (BMPs), including placement of sediment barriers, provision of flow bypass, and other applicable measures, would be included as necessary to control off-site movement of sediment.	Entire project area
68	Protect against sediment	For any perennial stream crossing culvert replacement, a specific dewatering plan shall be included with the contract design provisions.	Entire project area
69	Protect against sediment	All road reopening, reconstruction and temporary	Entire project area

	Objective	Design Feature	Location
		road building would occur when soils are relatively dry to avoid potential surface erosion of exposed soil.	
70	Protect against sediment	All temporary roads shall be made hydrologically stable if not being used for extended periods of wet weather.	Entire project area
71	Protect against sediment	Apply rock surfacing on all native surfaced roads to be used in the wet season between November 1 and May 31. The purchaser shall remove any rock used on temporary roads upon completion.	Entire project area
72	Protect against sediment	On segments of decommissioned roads in between fill removals, either build waterbars to divert surface drainage or de-compact the road surface to a depth of 18-22" to ensure infiltration of surface runoff.	Entire project area
73	Protect road infrastructure	Without an agreement through the contract process, any road maintenance along haul routes, including placement of additional surface rock, blading, brushing, ditch relief culvert cleaning or addition of ditch relief culverts would occur prior to project implementation.	Entire project area
74	Protect road infrastructure	At the completion of harvest and associated activities, reopened roads shall be closed (stored) and new temporary roads shall be decommissioned. Closed roads and decommissioned roads shall be placed in a hydrologically stable condition and closed to vehicle travel to reduce potential for surface erosion and sedimentation.	Entire project area
75	Reduce erosion and prevent channel migration	Stream crossings at Glenn Creek and Goose Creek will be reconstructed to pass 100 year flood flows and improve drainage and road surface runoff. Adjustments may occur to roadbed width, cross slope, horizontal and vertical alignment, and grades. An armored ford/dip would be constructed in Glenn Creek and the existing culvert in Goose Creek will be replaced with an armored ford/dip or culvert structure.	Road 2600275 in units 270, 290, 300
	Heritage Resources		
76	Protect previously unidentified heritage resources	Project activities planned outside of the area defined in the heritage resource inventory schema must be coordinated with the Zone Archaeologist prior to initiation.	Entire project area
77	Protect previously unidentified heritage resources	If cultural resources are encountered during the course of this project, earth-disturbing activities in the vicinity of the find must be suspended, in accordance with federal regulations, and the Zone Archaeologist notified to evaluate the discovery and recommend subsequent courses of action. Therefore, contract clause BT6.24 must be	Entire project area

	Objective	Design Feature	Location
		included in all project contracts.	
78	Protect previously unidentified heritage resources	Changes to current unit configuration would require coordination with the Zone Archeologist to protect known or unknown heritage resources.	All harvest units
79	Protect previously identified heritage resources	All National Register of Historic Places eligible and potentially eligible sites must be avoided during all project activities. Presale crew(s), road engineer(s), and the FMO/AFMO must coordinate with the Zone Archaeologist to ensure protection of the known cultural sites: 06180700038, 06180700041, 06180700353, 06180100354, 06180100602, 06180100603, 06180100604, 06180100605, 06180100606, and 06180100609.	See: Zone Archaeologist
	Scenic Quality		
80	Minimize visual impacts	A 50ft. horizontal no harvest buffer will be maintained on either side of Frissell Trail and marking to delineate this buffer will be minimized to the extent possible. Slash piles and all boundary markers within 100 feet of trail or trailhead would be removed. A recreation specialist would be consulted during layout and prior to implementation.	Units 460, 470, and 480
81	Minimize visual impacts	Gaps will appear natural and will not be noticeable to the casual forest visitor. Gaps will be placed to mimic natural openings, and where possible, placed adjacent to natural features such as meadows or rock outcrops.	Unit 10, 30, 110, 340, 350, and 470.
82	Minimize visual impacts	Temporary haul roads will be designed to blend into surrounding topography. Temporary haul roads will not be built perpendicular to the slope.	Unit 10
83	Minimize visual impacts	West, east and lower boundary of unit will be blended to maintain natural appearance.	Unit 10
84	Minimize visual impacts	Upper edge of unit will be blended to maintain natural appearance.	Unit 470
85	Minimize visual impacts	Where possible strive for an end product that is natural appearing and highlights the distinct natural and aesthetic character of these areas. Low or flush cut stumps at an angle 100 feet from highways, trails and recreation sites. Tree marking should be on the side of trees facing away from trails, roads and recreation sites.	All harvest unit treatments that are in visually sensitive areas (i.e., areas adjacent to Highway 126, Highway 242, the McKenzie River National Recreation Trail, Frissell Trail and developed recreation sites).
86	Minimize visual impacts	Gaps would be no larger than two acres.	Unit 110, 260, and 640
87	Improve scenic quality	Individual tree selection within 300 feet of Highway	Unit 110, 260 and 640

	Objective	Design Feature	Location
		126, highlighting large trees and special natural features.	
	Recreation		
88	Reduce impacts to recreating public	Post an advance notice as applicable at: Paradise Campground, McKenzie Bridge Campground, Limberlost Campground, Frissell Trailhead, and McKenzie River National Recreation Trailheads within and upriver of the project area. Provide postings to recreation department for further dissemination and posting as appropriate.	Entire project area
89	Reduce impacts to recreating public.	No fuels treatments would occur in or adjacent to Paradise Campground, McKenzie Bridge Campground, and Limberlost Campground while campgrounds are open in fee status. A recreation specialist will be integrated into the design phase for fuels treatment units in or adjacent to these campgrounds.	Units 930, 940
	Air Quality		
90	Monitor and control air quality in communities and Class 1 Airsheds	Follow Oregon Smoke Management Plan and Forest Plan Standard and Guides	All harvest units
91	Approve burning of units/piles given current fuels and weather conditions and monitor smoke during prescribed burn/pile burn	Survey fuels for estimate of particulate matter and obtain approval from ODF Smoke Management Forecaster.	All harvest units
	Transmission Lines		
92	Protect improvements of cooperators	Project activities in the vicinity of transmission lines and their access facilities would be coordinated with the Eugene Water & Electric Board prior to operations.	Entire project area

[1] Discretionary design features that are funding-dependent

2.6 Mitigation and Enhancement Common to Alternatives 2 and 3

Table 14. Wildlife Tree Mitigation and Enhancement Recommendations Common to Alternatives 2 and 3

Unit	Snag Creation per acre		Unit	Snag Creation per acre
10	1		470	2
70	2 2: RR only*		471	4*
130	2		480	2
200	2		490	2
260	2		500	2
300	2		520	2

Unit	Snag Creation per acre	Unit	Snag Creation per acre
320	2 2: RR only*	530	2
330	2 2: RR only*	550	2
340	2 2: RR only*	570	3
350	2 2: RR only*	580	3
380	2	690	3
390	2	691	4*
420	2	720	4*
450	2		

* Mitigation (will occur). Enhancement recommendations may occur if funding is available.

Tree mitigation and enhancement techniques may include topping, girdling and/or inoculation. Table 14 also includes mitigation measures from recommended Riparian Reserve thinning that includes snag creation to benefit wildlife (also shown in Table 11 and Table 12). Snag creation would take place as a priority mitigation measure within Class 3 and 4 streams as well as wetland and spring Riparian Reserves.

Table 15. Down Wood Mitigation and Enhancement Recommendations Common to Alternatives 2 and 3

Unit	Trees per acre to be left/felled for large down wood	Unit	Trees per acre to be left/felled for large down wood	Unit	Trees per acre to be left/felled for large down wood	Unit	Trees per acre to be left/felled for large down wood
10	5	260	3	440	3	630	3
30	5	270	0	450	3	640	3
40	5	280	3	460	3	650	3
50	5	290	3	470	3	660	3
60	5	300	3	471	5*	670	3
70	5 8 – RR Only*	310	0	480	3	680	3
80	5	320	3 8 – RR Only*	490	3	690	3
90	3	330	3 8 – RR Only*	500	3	691	5*
100	3	340	5 8 – RR Only*	510	3	700	3
110	0	350	5 8 – RR Only*	530	3	710	3
120	0	360	0	540	3	720	5*
130	3	370	3	550	3	740	3
140	0	380	3	570	3	760	3
150	3	390	3	580	3	770	3
190	3	400	0	590	3		
200	3	410	3	600	3		
210	3	420	3	610	3		

Unit	Trees per acre to be left/felled for large down wood	Unit	Trees per acre to be left/felled for large down wood	Unit	Trees per acre to be left/felled for large down wood	Unit	Trees per acre to be left/felled for large down wood
220	3	430	0	620	3		

* Mitigation (will occur). Enhancement recommendations may occur if funding is available.

The minimum amount to be left is 240 lineal feet/acre. Units proposed for regeneration harvest and those within Critical Habitat for the Northern Spotted Owl would have higher levels of down wood left/created to benefit the prey base of spotted owls. This table also includes mitigation measures from recommended riparian reserve thinning that includes large down wood creation to benefit wildlife, fish and water quality (also shown in Table 11 and Table 12). Down wood mitigation and enhancement would take place as a priority mitigation measure within Class 3 and 4 streams, as well as wetland and spring Riparian Reserves.

Table 16. Survey and Manage Species Buffer Recommendations Common to Alternatives 2 and 3

Units	Sensitive Species	Buffer Distance
10, 130, 380, 830, 970	*Nephroma occultum*	90 ft.
330, 410, 550, 640, 960, 970, 980	*Peltigera pacifica*	60 ft.
260, 830	*Usnea longissima*	180 ft.

Table 17. Special Habitat Buffer Mitigation Recommendations Common to Alternatives 2 and 3

Units	Special Habitat	Buffer Distance*
5150, 90, 5750, 5750, 1550	seep/rock outcrop	60 ft.
5360, 400, 600, 680, 1030, 1330, 1950, 1940, 1930, 1360, 1320, 1280, 5610, 42, 420, 5230, 380, 640, 1060, 1030, 1460, 1920, 110, 5460, 5260, 1200, 1310, 1500, 1861, 1350	wetland/seep/swamp	60 ft.
5660, 1280	mesic meadow	60 ft.
5340, 150, 5450	vine maple talus	60 ft.

*No-disturbance buffer distance is based on Special Habitat Management Guide. Buffers would be expanded if Aquatic Resource Specialists deems them insufficient to maintain hydrologic function.

2.7 Monitoring Common to Alternatives 2 and 3

Operations: Contract administrators would monitor treatments during implementation to ensure contractors are in compliance with their contract. Contract elements monitored would include harvest specifications, bole damage to residual trees, down wood and snag retention, skid trail spacing and use of designated skid trails.

Fuels Treatments: McKenzie River District fire and fuels personnel would monitor fuel loading prior to and post application of fuels treatments. Fuels treatment results would offer data to use in the future.

Road Management: McKenzie River Ranger district engineering personnel would monitor road management through contract administration and routine road maintenance inspections.

National Aquatic Best Management Practice Monitoring: The National Best Management Practices Program provides a standard set of core best management practices and consistent documentation of the use and effectiveness of the practices. Post-implementation best management practices monitoring may include review of aquatic management zones, erosion prevention and control measures, cable and ground-based yarding operation effects, and site treatment.

Forest Plan Implementation Monitoring: The Forest Supervisor's Staff performs annual project monitoring at each Ranger District and compiles the results in the yearly Forest Monitoring Report. Implementation of treatments from this project would be subject to Forest Plan Implementation monitoring. Other implementation monitoring elements may include temporary road decommissioning, snag and large down wood abundance, and any seeding or planting of vegetation.

Reforestation: Ensure stand is sufficiently stocked within five years. Forest Service Manual directs us to conduct first and third year stocking surveys to determine if the site can be certified.

Dead Wood Habitat Monitoring: McKenzie River Ranger District wildlife personnel would monitor snag and large down wood habitat levels in units prior to wildlife tree and down wood enhancement activities and after prescribed burning, if applicable. This would determine existing habitat levels and compare those with the amounts needed for mitigation and enhancement activities. Monitoring may also be conducted after underburning to evaluate the level of tree mortality and snag creation from fire.

Chapter 3 - Affected Environment and Environmental Consequences

This section of the FEIS considers the environmental consequences of implementation of the various alternatives. The following discussion of effects follows CEQ guidance for scope (40 CFR 1508.25(c)) by categorizing the effects as direct, indirect, and cumulative. The focus is on cause and consequences. For this analysis, in general, direct and indirect effects have been discussed in the context that most readers are accustomed to: those consequences which are caused by the action and either occur at the same time and place, or are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8). Cumulative effects are discussed where there is an effect to the environment which results from the incremental effect of the action when added to other past, present, or reasonably foreseeable future actions (40 CFR 1508.7).

The analysis of direct, indirect, and cumulative effects on each resource includes defined analysis area boundaries, as well as the length of time effects are expected to last. These are specific to each resource and therefore may vary in physical and temporal scale.

Interdisciplinary Team

The interdisciplinary team (IDT) includes Forest specialists for each discipline (Chapter 4, for team members and their qualifications). Specialists on the IDT prepared technical reports to address the affected environment and expected environmental consequences of the proposed action and alternatives of the Goose project. All reports are maintained in the project file, located at the McKenzie River Ranger District in McKenzie Bridge, Oregon. In some cases, this chapter provides a summary of the report and may only reference technical data upon which conclusions were based. When deemed appropriate, those parts of specialist reports that are not included in this FEIS are incorporated by reference (40 CFR 1502.41).

Role of Science

Science information improves the ability to estimate consequences and risks of decision alternatives. The effects of each alternative are predicted based on science literature and the professional experience of the IDT specialists. The conclusions of the IDT specialists are based on the best available science and current understanding. Relevant and available scientific information is incorporated by reference and a complete bibliography is included at the end of this FEIS. Referenced material is a consideration of the best available science.

Cumulative Effects

The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

The cumulative effects analysis in this document is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

> CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The

> final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR 1508.7)

Appendix D provides a summary of past, present, and reasonably foreseeable activities in the project area that could contribute potential cumulative effects to the environment along with the Goose project.

3.1 Forest and Stand Structure

3.1.1 Summary of Effects Analysis

Stands proposed for treatment are in a condition that would respond and benefit from thinning, based on stocking levels, average stand diameters and crown ratios. Thinning and adding diversity with gaps, dominant tree release (DTR), and skips would improve the growth and maintain the health of residual trees by reducing the competition between trees, develop the understory and diversify the species composition by opening up the tree canopies. Skips within these stands, within Riparian Reserves, and other sensitive areas, as well as selected areas of wildlife tree and large down wood creation where needed, would add another element of stand diversity.

Thinning, DTR, and gaps would promote the development of a diverse, multilayered stand structure providing conditions that favor the establishment of shrubs, hardwoods, and conifer in the understory, and by releasing saplings and intermediate-crown class trees in the stand. Increased growth of the understory would provide a more contiguous bed of green, high moisture content, less flammable vegetation on the forest floor. Thinning, DTR and gaps would promote crown differentiation by allowing overstory trees to develop deep canopies and larger diameter branches in open stands. As the crowns differentiate, the risk of fire spreading from crown to crown goes down.

Thinning, DTR, gaps, and skips would maintain or enhance stand level, plant species diversity, composition and structure.

Gaps, DTR and regeneration harvest would provide for acres of stand initiation. Stand initiation acres would provide for long term (80-100 years) sustainable timber production.

Commercial harvest in both alternatives would shorten the duration stands spend in successional stages, moving stands more quickly through stem exclusion resulting in fewer snags on those harvested acres from suppression mortality.

3.1.2 Scale of Analysis

The scale used to evaluate direct, indirect and cumulative effects on Forest and Stand Structure associated with the Goose project is the project area. The project area consists of 17,932 acres within the Florence Creek-McKenzie River, Elk Creek-McKenzie River, and Lost Creek 6th field watersheds. By using the project area, it is possible to evaluate potential impacts in an area large enough to encompass other disturbances, both human and natural, and it is a logical analysis area to assess stand conditions based on plant associations.

3.1.3 Affected Environment

The project area consists of approximately 17,932 acres. 14,713 acres in the project area are managed by the Willamette National Forest with the remaining 3,219 acres belonging to private land holders. The project area is composed mostly of a Douglas-fir and western hemlock overstory with an understory shrub component of vine maple, salal, dwarf Oregon grape, sword fern and Pacific rhododendron.

Timber harvest including thinning, partial cut and regeneration harvest has been a dominant disturbance in the project area over the last 100 years. Previous timber harvest has occurred on approximately 4,161 acres in the project area. Approximately 2,740 acres in the project area were modified with regeneration-type timber harvest, which is now in plantations less than 75 years old. Fire has also been a dominant disturbance in the project area. Records indicate four large, stand replacing wildfires have occurred in the project area over the past 100 years and an approximated 69 smaller, low to moderate severity fires since the 1970s.

Stand Age Classification

Stand age of Forest Service managed lands in the project area was determined using data from the Forest Service's VEGIS database in addition to stand exam data collected 2010-2012. Stand age in the project area is distributed into four categories: Stand Initiation, Stem Exclusion, Understory Re-Initiation, and Old Growth.

Stand Initiation - Young Managed Plantations (0-30 years old)

Stands in this category are the younger second growth plantations originating from regeneration harvest which took place in this area in the late 1980's and 1990's. These stands are in the stand initiation development stage as described in Oliver and Larson (1990). Most stands were re-established by planting conifer seedlings after the regeneration harvest at stocking level to ensure survival of fully stocked sites. Other plants – trees, shrubs, and herbs grow from seed, sprouts, advance regeneration, and other mechanism are also invading the sites and compete for the open growing space. Growth is usually rapid with competition for the available growing space. Generally, these stands have low to moderate amounts of downed woody debris and standing snags. Stand initiation represents approximately 640 acres, or 3.7 percent of the forested lands administered by the Forest Service in the project area (Figure 10).

Stem Exclusion - Second Growth Plantation (31-80 years old)

Stands in this category are the older second growth plantations originating from early clearcut harvest treatments in the 1940's to the early 1980's and wildfires in the early part of the decade (see Fire and Fuels Section). This stand type can be characterized as a dense, closed-canopied, even-aged stand. Based on the stand development classifications developed by Oliver and Larson (1990), these stands are classified as stem exclusion. The stem exclusion stage occurs after canopy closure, as the stand begins to differentiate into size classes and shading and competition for nutrients and water by larger trees leads to death of smaller trees and much or all of the understory vegetation. Some of timber stands established after wildfires have a scattered overstory of remnant old–growth. Past logging utilization practices, fuels treatments, and safety regulations governed the amount of downed woody debris and standing snags retained in the plantations. Generally, these stands have low to moderate amounts of downed woody debris and are absent of standing snags. Stem exclusion represents approximately 2,750 acres, or 15.7 percent of the forested lands administered by the Forest Service in the project area (Figure 10).

Understory Re-initiation - Mature (81-180 year old)

Stands in this category are characterized as a fairly uniform, single-canopied, even-aged stand. These stands are in the understory re-initiation development stage. During the understory re-initiation stage, crown recede and scattered overstory trees begin to die, and herbs, shrubs, and tree regeneration (usually shade tolerant species such as western hemlock, western red cedar, and true firs) appear on the forest floor. Many of these stands originated from wildfires that occurred in the late 1800s and early 1900s. The lack of legacy structural components such as snags and coarse downed woody debris left over from the previous stands suggest a fire regime of re-burns or multiple underburns fires over the last 2 centuries. Understory re-initiation represents approximately 5,360 acres, or 30.7 percent of the forested lands administered by the Forest Service in the project area (Figure 10).

Old Growth - Old Growth (greater than 180 years old)

Stands in this category are characterized as old growth (Oliver and Larson, 1990) and would generally meet the definition of old growth, and in some cases the PNW-447 (USDA, 1986) old growth criteria. The stands have large, live trees, often dominated by seral Douglas fir; large, dead, standing and downed trees; multi-layered canopy; and a heterogeneous understory. The old-growth stage occurs when overstory trees die sporadically and understory trees begin growing into the overstory, creating multiple canopy layers and gradual shift towards a stand dominated by tolerant species. Many of these stands have been previously salvage logged to remove wind throw and mortality. Old Growth represents approximately 8,713 acres, or 49.9 percent of the forested lands administered by the Forest Service in the project area (Figure 10).

Figure 10 illustrates the current stand age classifications in project area and Table 18 provides the acreages of each stand age classification and the acres proposed for harvest in each category by alternative.

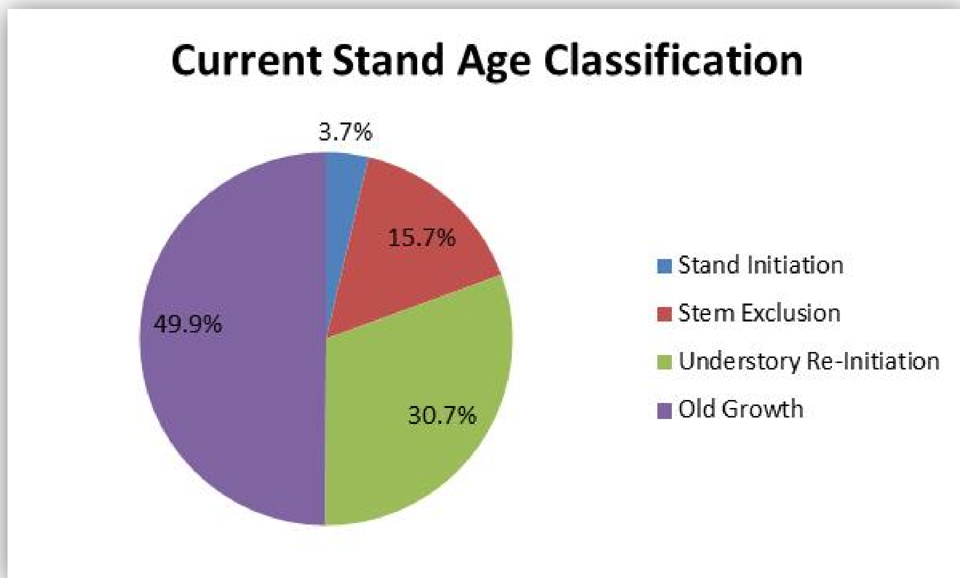

Figure 10. Stand Age Classification in the Goose Project Area

Table 18. Harvest Units by Alternative and Stand Age Classification

	Stand Initiation (0-30 years old)	Stem Exclusion (31-80 years old)	Understory Re-Initiation (81-180 years old)	Old Growth (>180 years old)
Project Area[1] (acres)	640	2,750	5,360	8,713
Alternative 2 (acres)	51	1,515	490	0
Alternative 3 (acres)	51	690	0	0

[1]: Does not include non-forest areas such as meadows and rock outcrops

Stand Vigor and Growth

Stand Density Index

Harvest is proposed in both previously managed stands and fire regenerated (naturally regenerated) stands with the proposed action. Seventy-four percent (Table 18) of previously managed stands and fire regenerated stands proposed for harvest in the project area are second growth stands classified as being in the stem exclusion development stage (Oliver and Larson, 1990). Stands in this stage have dense crowns which block out the light to the forest floor and limit additional tree regeneration in the understory. Shade-tolerant understory trees that are present persist but grow very slowly. Intermediate or suppressed trees that do not tolerate shade well suffer from competition and have an increased mortality rate.

Stand vigor and growth is declining in these stands. Some trees have begun to die due to overcrowding and competition between trees for nutrient and light as evidenced by competition-induced mortality. The Stand Density Index (SDI), which is a qualitative measure of tree competition within a stand, ranges from 214 to 554 and averages 366 for all stands being considered for treatment in the Goose project area. In Douglas-fir, the maximum SDI (SDImax) is 595 (Reineke 1933). Using SDI helps translate current conditions to future objectives, such as reduced competition to maximize individual tree or stand growth. As a stand reaches an SDI of about 149, or approximately 25 percent of SDImax, trees within the stand start to compete with each other. As SDI increases to around 357, or 60 percent SDImax, trees reach a point at which they start dying due to competition, or self-thinning (Long, 1985). Lower SDImax numbers are more suited to maximize individual tree growth, while harvesting when SDI reaches around 208-238, or 35-40 percent SDImax, the stand as a whole would have maximum growth.

Existing stand conditions were quantified using 2010-2012 stand exam data. The April 2014 version of Forest Vegetation Simulator (USDA Forest Service 2008, Pacific Northwest model with Western Cascade variant, revised April, 2014) was used to analyze stand data.

Previously Managed Stands

Approximately 851 acres of previously managed stands are proposed for harvest in the proposed action. Over about the last 80 years there has been approximately 2,740 acres (15 percent of the project area) of clearcut on federal lands within the project area. The earliest clearcut was harvested in the 1940’s while the most recent occurred in 1993. Most of these stands have received thinning through either pre-commercial or commercial thinning. Some appear to not have received any management since establishment. There has also been approximately 315 acres commercially thinned that was not associated with previous clearcuts.

In previously managed stands, the average age of the stand is 44 years old with the range between 27 and 66 years old. Many of the stands are just starting to enter the stem exclusion stage or are already well in the stem exclusion stage with SDI's averaging 334. Little understory development and species diversity appears to be in the stands.

Fire Regenerated Stands

Approximately 1,205 acres of fire regenerated (naturally regenerated) stands are proposed for harvest in the proposed action. The project area has been shaped by wildfires as well as timber harvest over the past 100 years. Our fire records show that there have been four large fires within the planning area in the last century: two Sims Ranch Fires (approximately 1925 and 1935), North McKenzie Fire (approximately 1949), and South McKenzie Fire (approximately 1949). Each of these fires were stand replacing events that left few residual trees. There also appears to have been stand replacing fires in the 1800's. With no records to suggest otherwise, the stand replacing fires are believed to have been regenerated naturally with predominantly Douglas-fir. All of the fire regenerated stands are predominantly Douglas-fir with scattered hardwoods and very little species diversity in the overstory.

Many of these fire regenerated stands do not show signs of active management since regeneration occurred. However, some of the stands do have residual stumps representing either salvage logging or selective harvest. Our records show no harvest activity in the fire regenerated stands. Nevertheless, in many of these stands large (>30" dbh) residual cedars were cut and left on site. There is also old tractor skid roads in many of these stands, indicating forest products were removed from the area. With very little residual large snags and stumps located in the fire regenerated stands, a possible conclusion could be that there was multiple stand replacing fires that occurred in the area. If the fires occurred relatively shortly after each other, it would explain the lack of legacy features, which could have been consumed by the subsequent fire(s).

In the fire regenerated stands proposed for treatment, the average age is 81 years old with a range of 50 to 127 years old. Because the majority of these stands are within the stem exclusion stage, only small amounts of understory development is apparent as the stands have started competition mortality. The fire regenerated stands proposed for harvest in the Goose project have an average SDI of 417 (Table 19) which is 70 percent of maximum SDI.

Table 19 illustrates average stand characteristics of previously managed and fire regenerated stands proposed for harvest in the project area.

Table 19. Average Stand Characteristics of Trees at Least 7 inch DBH[1]

Stand Type	Trees Per Acer	Quadratic Mean Diameter	Average Stand Height	Canopy Cover Percent	Age	Basel Area	Stand Density Index
Fire Regenerated	146	19	102	64	81	270	417
Managed[1]	172	14	83	66	44	185	334
All	162	16	90	64	59	218	366

[1]: Seven inches is the minimum DBH of a tree considered for harvest in the Goose project.

3.1.4 Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Growth rates would continue to decline, and natural processes that affect tree vigor and cause changes in stand structure would continue. The effects of overstocked stands include decreased growth, increased rates of mortality, higher risk for insect and disease attacks, and higher risk for stand replacing fires. Decline in underrepresented species, like sugar pine (*Pinus lambertiana*) and western red cedar (*Thuja plicata*), would continue. Shade tolerant species, like western hemlock, would eventually dominate the stand in absence of timber harvest and/or other disturbances. High stocking density and canopy covers would continue to restrict regeneration of shade intolerant species such as Douglas-fir and sugar pine. The diameter and product value of trees harvested in the future would be reduced without treatment.

The current shortage of early seral habitat for wildlife species would continue to decline (see Figure 25). Low light levels in un-thinned stands would suppress development of shade-tolerant trees and limit understory vegetation. Tree mortality from overstocked stands and root disease would continue, and competition-induced mortality would increase, thus increasing small diameter <15" snags and down wood. The competition-induced mortality would not be available for commercial wood products. Fuel loading and fire risk in the Wildland-Urban Interface (WUI) would increase as trees die and eventually fall over.

Alternative 2 and 3

The following treatments are used to describe the direct and indirect impacts for treatments that would occur with both action alternatives.

Thinning

Thinning would increase the health and vigor the remaining trees and help increase the stand's ability to adapt to environmental changes. Additional light, from reduced canopy cover, reaching the forest floor would help promote a second cohort of trees. Both shade-tolerant and intolerant species may be established; however, shade-tolerant species would thrive over time as the overstory crown closes. The canopy cover is estimated to increase two percent per year (Chan, 2006). This second generation of trees growing under the overstory canopy is expected to provide vertical, horizontal, age, and species diversity in the stand by primarily harvesting Douglas-fir which is over represented in the project area because of planting densities.

Conifer trees would be removed through commercial thinning across all size classes, but would primarily consist of smaller diameter trees with an emphasis on retention of sugar pine and white pine; however these species may be cut for operational purposes. This prescription would also maintain or increase vegetative diversity in the understory by opening the canopy to allow for growth of seedlings, as well as the development of understory shrubs and forbs which have broad ecosystem benefits. Figure 11 provides visualization of a stand before and after thinning.

Thinning provides growing space for new trees to increase age, size and height diversity in a stand and at the project area scale. Young uniform stands such as the plantations and many natural stands proposed for treatment in the Goose project can be diversified with early thinning by allowing new generations of trees to establish. Early commercial thinning has been shown to be beneficial to the future development of understories, the promotion of natural regeneration, and in enhancing biodiversity (Muir et al 2002). With early thinning, overstory trees can develop deep canopies and large-diameter branches in open stands (McGuire et al 1991). Low overstory density facilitates the establishment of understory trees (McGuire et al 1991, Bailey and Tappeiner 1998, Miller and Emmingham 2001).

Treating mature stands (stands in understory re-initiation [81-180 years old])in the project area is expected to increase availability of resources such as sunlight to the forest floor for increased diversity of shrubs, herbs, and understory tree establishment and growth with the effects lasting up to about 15-20 years as the overstory crown closes in (Chan, 2006). In addition to the understory response, increased growth in the overstory is expected to last up to about 25 year (Latham and Tappeiner, 2002). Williamson

(1982) found that 19 years after heavy thinning, a 100 year old thinned stand, had a 30 percent higher response to volume growth than did the control units. Thinning across all crown classes in a stand provides the longest term benefits to both large and small trees because of the time it takes to fill in the overstory canopy (Williamson and Price 1966).

Heavier thinning would likely promote rapid growth of trees with characteristics normally associated with old trees in old-growth stands. The large older trees in a stand often showed signs of rapid growth in lower densities when they were young (30-100 years), producing large stems and crowns. Evidence (Franklin et al 1981, Tappeiner et al. 1997) suggests that growth rates of some older forests indicate slow regeneration and at low densities over a long period with little tree-to-tree competition. Old-growth stands typically have multiple canopy layers, and thinning promotes a second cohort, or canopy layer, by allowing for natural regeneration to occur (Tappeiner et al. 1997).

Some old-growth forests appear to have developed from relatively even-aged cohorts that have undergone long-term suppression mortality, little understory regeneration of Douglas-fir, and episodic release of established tolerant conifers (Winter et al 2002a, 200b). Therefore, stand management can follow multiple routes that emulate natural processes to move dense young stands towards structure similar to old-growth forest.

A short-term adverse effect of less than one year would impact to understory vegetation and below ground fungi would be the mechanical damage from logging. These short-term adverse effects would be expected to recover within two years post-harvest as regrowth of herbs and shrubs occur. The removal of host trees and soil disturbance from the yarding operation impacts below ground fungi (Courtney et al 2004). This adverse effect is reduced by minimizing additional soil impacts with the use of designated skid trails with ground–based yarding systems and log-suspension capabilities of skyline and helicopter yarding systems.

Figure 11. Visualization of Stand Before (left side) and After (right side) Thinning

Gaps

Gaps would consist of approximate 1-3 acre openings with rolling edges where appropriate to avoid circles or square edges. Gaps would be randomly placed unless it was necessary to strategically place the openings for other resource needs such as minimizing conflict with logging systems, minimizing visual concerns, or to treat an identified root rot pocket. Within the stand, a thinning prescription would be applied to the area outside the gaps. Figure 12 provides a visualization of thinning with gaps.

The gaps would not be a conventional clear-cut treatment. The objective would be to leave some green trees in either scattered pockets and/or scattered throughout the opening post-harvest. These retention trees would be released to grow to encourage large tree development, future snag development, diversity in future stand structure, and development of future large down woody debris. In 30 to 60 years the stand structure would be more complex with at least a two cohort stand making up the overstory. This would better mimic some late successional characteristics than what the current stand is projected to produce in the same time frame if no treatment occurred (Andrews et al. 2005). These areas would also provide early seral habitat on federal land in the project area. Retention trees that meet the criteria for a wildlife tree (i.e. *Phellinus pini* conks or other elements of wood decay, crooked tops, etc.), would serve as a natural wildlife tree and offset the need for enhancement however they would not be used for down wood enhancement.

By implementing gaps, the project would provide numerous benefits for many species of wildlife. For birds, gaps have been shown to provide habitat to shrubland birds not present in mature forest (Chandler et al. 2009) while generally providing more fruit and more resource abundance due to a lower canopy and increased fruiting (Blake and Hoppes. 1986). Generally, with gaps, provide more resources to herbs, shrubs, and broad-leaved plants which provide the foundation for food webs that contribute towards many different trophic levels in Pacific Northwest conifer forest (Hargar, 2007).

Openings of this size should both facilitate stand treatments and help to assure satisfactory development of regeneration (Curtis and Carey, 1996). Because some of the gaps would be relatively small for regeneration of shade intolerant species, there would be an edge effect (shade from residual trees around the edge of the opening). Height growth would be greater near the center of the opening and away from any leave trees. The gaps would be expected to be re-forested in the future and allow a chance for shade intolerant species such as Douglas-fir to regenerate.

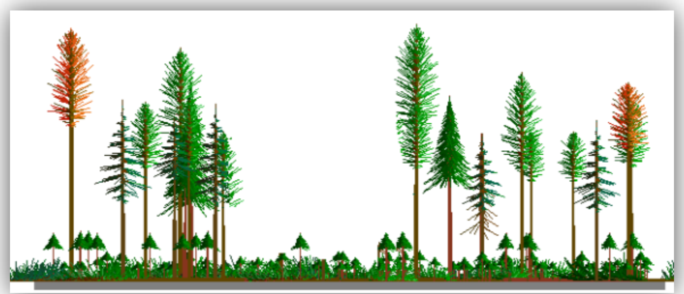

Figure 12. Visualization of Thinning with Gaps

Dominant Tree Release (DTR)

This prescription would provide for growth of a dominant tree or group of five to ten trees to promote larger trees scattered throughout the stands. This meets the purpose of improving stand conditions in terms of species composition, diversity, density, and structure. The area around the dominant tree would be cut to a radius of 66 feet from the bole of an individual tree, or each tree in a group. Around an individual tree, the 66 feet equates to approximately ¼ acre (accounting for drip-line of trees) when one tree is identified. When five to ten trees in a clump are identified, the opening size would vary depending on the number and spacing of trees retained but would likely range from an estimated 1/3 to ½ acre. Sugar and white pine over 24” in size would be treated as a dominant tree.

DTR would result in open grown trees more likely to develop larger limbs lower to the ground, which could serve as wildlife habitat (McGuire et al 1991), as well as greater taper, reducing tree susceptibility to wind damage in the future. Figure 13 provides a visualization of DTR.

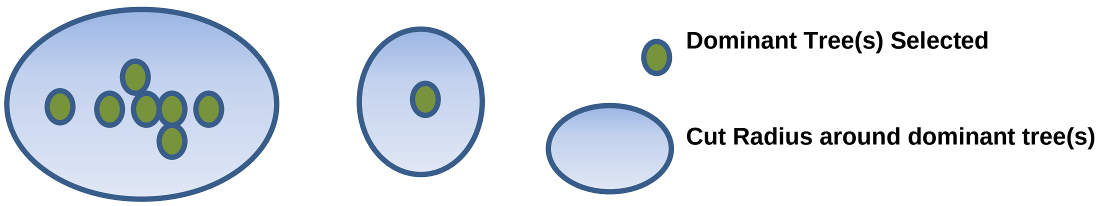

Figure 13. Visualization of Single vs Multiple Tree Dominant Tree Release

Regeneration Harvest – Shelterwood with Reserves

Regeneration harvest (shelterwood with reserves) would occur in stands that have reached at least 95 percent culmination of mean annual increment. Although nothing can exactly mimic naturally occurring disturbance events, this harvest would create a small-scale disturbance in the analysis area somewhat similar to what may have occurred naturally. The objective would be to leave approximately 20 trees per acre following harvest to help establish a future stand by providing a beneficial microclimate, and contribute towards creating snags and down wood. Those residual trees not used for snag and down wood creation would be retained throughout the rotation. The residual trees would on average be larger trees including some with disease to promote natural processes. These residual trees would provide for future snag development, and down woody material to provide diversity in the future stand structure.

Even-aged systems provide an optimal seedling environment for the establishment and growth of the shade intolerant species presently on site. The residual live trees are used to provide seed and/or protection from environmental extremes. The residual green trees are well-dispersed through the unit to provide a consistent level of protection. The residual canopy would be composed of the largest trees in the stand, primarily Douglas-fir. As identified in the Standards and Guidelines of the Northwest Forest Plan, at least 15 percent of each stand (not including Riparian Reserves) would be retained in no-harvest patches to provide diversity and maintain existing snags (Northwest Forest Plan, pg. c-41). The retained patches would be scattered and variable in size. Stands treated as regeneration harvest would be treated for fuels reduction, and planted with a variety of tree species after harvest. Large wood on the forest floor would be maintained or enhanced. Numerous snags would either be maintained on site if not a hazard to logging operations, or enhanced through snag creation techniques. Figure 14 provides a visualization of regeneration harvest treatment.

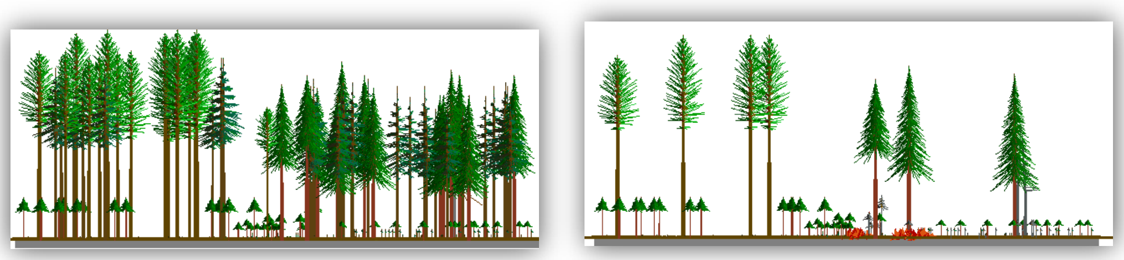

Figure 14. Visualization of Shelterwood with Reserves Pre (left side) and Post (right side) Treatment

Skips

Skips are areas where no harvest would occur. Stands that are not harvested would provide diversity within the thinned stand. These areas would be allowed to have natural processes take place such as inter-tree competition, which would create snags and down woody material. However, there would be an edge effect that could take place along the skips edge. Skips would be dispersed between riparian and non-riparian areas. Depending on the location and positioning of the skip, the edge effect could allow for more light to reach the trees along the edge and forest floor. This extra light could lead to greater growth of some of the individual trees, forbs, and shrubs along the edge.

Implementation of skips would be with hard boundaries flagged on the ground along unit boundaries and within units. Additionally, internal skips may include identifying a tree and not including for harvest any other tree within a specified distance of that identified tree.

Comparison of Effects from Alternative 2 and 3

Both action alternatives would have the same beneficial effects previously identified on treated acres (see Table 20). However, Alternative 3 would harvest fewer acres resulting in approximately 982 acres of fire regenerated stands remaining with a SDI of over 70 percent of maximum SDI. By maintain the high SDI, fire regenerated stands in Alternative 3 would show the same effects as Alternative 1, the No-Action alternative and none of the benefits associated with the Action alternatives.

Alternative 2 would use thinning and dominant tree release (DTR) on 1,268 acres 250 percent more acres than the 499 in Alternative 3, to improve or maintain growth and health of overstocked stands currently in stem exclusion. Thinning and DTR would open up the tree canopy allowing more sunlight and precipitation to reach the forest floor. This would result in changes in the microclimate (increased air and soil temperatures, relative humidity’s, and air movement), under the main canopy for a short term (10-20 years) until the canopy closes back in (Chan, 2006). These changes in microclimate stimulate an increase in favorable growing conditions for most plant species.

Alternative 2 would treat 1,549 acres with thinning, DTR, and gaps to promote the development of a diverse, multi-layered stands, whereas Alternative 3 would only treat 610 acre. The treatments would primarily aid by providing conditions that favor the establishment of shrubs, hardwoods, and conifer in the understory, and by releasing saplings and intermediate-crown class trees in the stand. Thinning, DTR, and gaps would also promote crown differentiation by allowing overstory trees to develop deep canopies and larger diameter branches in open stand. As the crowns differentiate, the risk of a fire spreading from crown to crown goes down.

Thinning, DTR, gaps, and skips would maintain or enhance stand level, plant species diversity, composition and structure on 744 acre in Alternative 3, or 63 percent fewer acres than 2,013 associated with Alternative 2. Species richness for herbaceous species and total species richness across trees, shrubs, and herbaceous vegetation were greater in thinned stands than in un-thinned and old-growth stands (Bailey et al 1998).

Moving acres into stand initiation, Alternative 2, Gaps, DTR, and regeneration harvest would provide for 374 acres compared to 141 for Alternative 3. Those acres would provide for long term (80-100 years) sustainable timber production.

Through commercial harvest, fuel loading would increase on 610 acres with Alternative 3, compared to 1,592 acres associated with Alternative 2. The fuels added would mostly be smaller in size from limbs and needles which typically decompose within 2-3 years. Increased growth of the understory would provide a more contiguous bed of green, high moisture content, less flammable vegetation on the forest floor. Please see the Fire and Fuels section for more information on fuel loading.

Commercial harvest may cause some stages of forest succession to be shortened due to accelerated growth and enhancement activities (Andrews, et al 2005). These stands would more quickly move from stand initiation to understory re-initiation and on to old growth.

Table 20 compares the acreages proposed for treatment in each alternative.

Table 20. Comparison of Treatments (acres) by Alternative

Treatments	Alternative 1	Alternative 2	Alternative 3
Acres of Thinning Outside Riparian Reserves	0	1,080	412
Acres of Thinning Within Riparian Reserves	0	138	57
Acres of Regeneration Harvest	0	43	0
Acres of Gaps	0	281	111
Acres of Dominant Tree Release	0	50	30
Acres of Skips Outside Riparian Reserves	0	173	45
Acres of Skips Within Riparian Reserves	0	291	89
Total Acres of Timber Harvest Units (includes skips)	**0**	**2,056**	**744**

Cumulative Effects

Alternative 1 – No Action

With implementation of Alternative 1, no cumulative effects to forest stand and structure would occur as the effects of Alternative 1 do not overlap in space and time with effects from any past, present or reasonably foreseeable future actions.

Alternative 2 and 3

Effects to forest stand and structure from Alternatives 2 and 3 overlap in time and space with effects from two past projects - the Eagle Thin Project and the 13-Thin Project. The Eagle Thin Project was located directly west of the project area. Harvest was completed on Eagle Thin in 2014 and treated approximately 176 acres with thinning similar to that of the Goose project. Harvest was completed on 13-Thin Project in 2014. 13-Thin was located in the project area between the McKenzie River Ranger Station along Foley Ridge Road (FS Road 2643), and treated approximately 160 acres with thinning and small gaps. The Pass Thin Project was approved in 2014. Pass Thin contains acreage within and outside the project area, and it includes eight acres of thinning and three gaps in the project area.

Effects to increased age diversity (acres move back to stand initiation) on the landscape from activities associate with the Goose project would have a beneficial cumulative effect. By adding Goose's acres to the acres of gaps associated with Pass Thin (3 acres), and 13-Thin (7 acres), Goose would cumulatively increase the acres of forest in the stand initiation stage within the project area to 384 and 151 acres for Alternatives 2 and 3 respectively.

In conjunction with Pass Thin, Eagle Thin, and 13-Thin the Goose project would cumulatively help maintain or enhance plant species, and diversity and composition in the project area on 2,403 and 1,091 acres for Alternatives 2 and 3 respectively. Additionally, the same acres would cumulatively promote crown differentiation.

When looked at with Pass Thin, Eagle Thin, and 13-Thin, treatments associated with Goose would reduce the time 1,939 and 957 acres for Alternatives 2 and 3 respectively are in the stem exclusion stage of stand development, which would limit the number of snags attained through suppression mortality on those acres.

No cumulative effect to fuel loading is anticipated because of the lag in time from harvest associated with the Goose project and the Pass Thin, Eagle Thin, and 13-Thin projects.

Connected Actions

The following actions and effects would occur with implementation of both Alternative 2 and 3.

Post-harvest Tree Planting

Reforestation would be required in both Alternatives. Alternative 2 would require approximately 120 acres (approximately 43 acres with Shelterwood harvest and approximately 77 acres of gaps) and Alterative 3 would require approximately 48 acres associated with gaps. Reforestation would be expected to occur within five years of harvest, and occur from both tree planting and natural regeneration. Post-harvest densities would be sufficiently low to allow shade-intolerant species such as Douglas-fir to regenerate in addition to increasing diversity with the ingrowth of species such as western white pine and western red cedar. Slash and other debris would be utilized as shade and as a deterrent to browse by ungulates. Planting in identified root rot pockets would be species that are less susceptible to root rot like western red cedar, sugar pine, white pine or red alder. Reforestation would help to ensure sustainability of the stands into the future. An increase in species diversity in the planted stands would result as a mix of species which represent historic species composition would be planted.

Subsoiling

Subsoiling would occur when a unit has compaction levels above Forest Plan Standards and Guidelines. Subsoiling is beneficial to Forest and Stand structure because of reduced compaction and root growth, so increased growth is possible likely along skid trails and landings that have subsoiling. Skid roads in planting areas are expected to be subsoiled to a depth of 18-22 inches to reduce the effects of compaction with the exception of soils under a retention tree canopy because the roots of the given tree would be less disturbed. Compaction from skid roads has not shown a reduction in residual tree growth (Miller et al, 2007). Some adverse effects may occur if residual trees inadvertently have roots pruned by the subsoiling.

Temporary Road Construction and Decommissioning

Temporary road construction and decommissioning would occur where temporary roads are necessary to facilitate project activities. The initial effects of the construction would be compacted soils which could affect Forest and Stand Structure; however those effects would be offset by decommissioning. The effects of decommissioning would be the same as subsoiling, and is generally beneficial to the residual stand because of reduced compaction and root growth, so increased growth is possible likely along skid trails and landings that have treatment. Some adverse effects may occur if residual trees inadvertently have roots pruned during decommissioning.

3.2 Fire and Fuels

3.2.1 Summary of Effects Analysis

Proposed actions for Alternative 2 would reduce slash following timber harvest, reduce understory fuels and ladder fuels along private and public boundaries and conduct natural fuels underburns (non-harvested units). All actions are with the McKenzie Bridge community Wildland-Urban Interface (WUI) and would act as beneficial fuels reduction aiding in reducing risks to firefighters and public, structures and resources during wildfires. Forest structure and fuels would change through harvest and all fuels treatments to reduce activity generated fuels to within or below Forest Plan standards and guidelines and create variability of horizontal and vertical fuels (vegetation). Additionally, beneficial fire effects would occur from prescribed fire treatments as fire plays a natural and dynamic role in the forest ecosystem.

3.2.2 Scale of Analysis

Project and stand specific data, as well as landscape level data, were used due to the nature of fire as a natural disturbance and how it moves across the landscape. Stand level information was used to identify and predict specific fuels characteristics and effects.

3.2.3 Affected Environment

Fire on the Landscape

Over the past 100 years, records indicate four large wildfires within the project area ranging in size from 480 to 1,715 acres. Additionally, since 1970, records indicate there has been approximately 69 smaller, low to moderate severity fires within the project area ranging in size from .1 to 38 acres. All fires over the past 100 years were promptly suppressed and the larger ones most likely moved quickly and escaped initial fire suppression efforts. These past fires demonstrate wildfire will continue to occur across the project area and greater landscape that surrounds the community of McKenzie Bridge. Fire is a natural disturbance and the influences of human actions (development, fire suppression, and logging) over the past century have changed fire disturbances and processes across the project area. Fire regime models (categorized at larger landscape scale than the project area) indicate the project area to be a mixture of Fire Regime (FR) I, III and V, with FR V found at higher elevations along Lookout Ridge. Fire regimes are described below. Figure 15 displays the fire regimes in the project area.

- **Fire Regime I:** < 0 to 35-year fire return interval; low severity
- **Fire Regime III:** < 35 to 150-year fire return interval; mixed severity
- **Fire Regime V:** 150+-year fire return interval; high severity

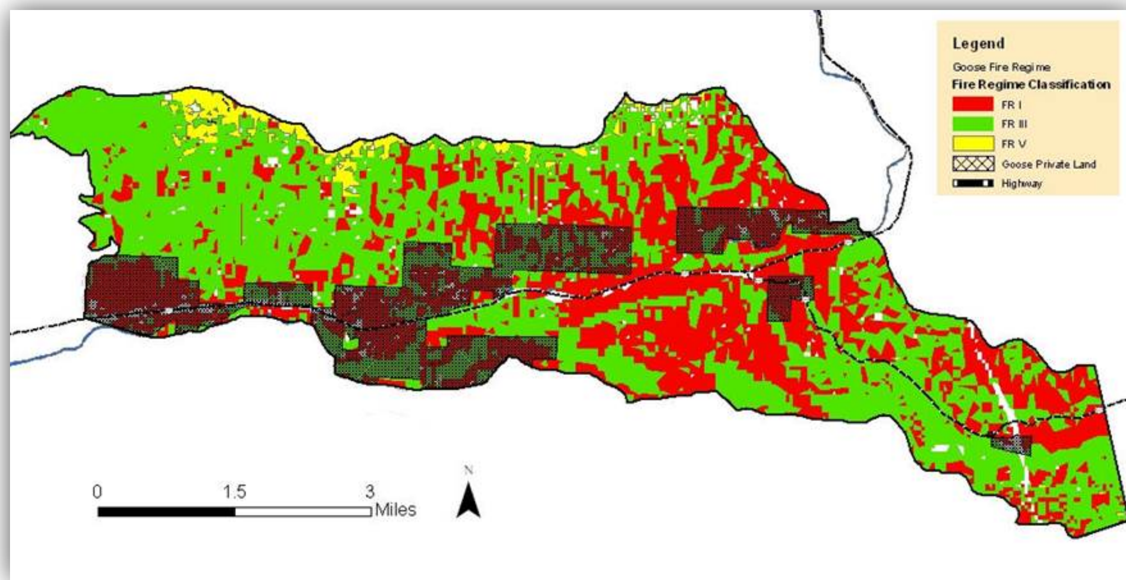

Figure 15. Fire Regimes in the Goose Project Area

Of importance in fire regimes on the Willamette National Forest is the term mixed severity. Mixed severity explains the varying degrees of fire intensity (heat) and severity (mortality) that can occur given variations in topography, vegetation, and fire resilience of larger trees across a landscape. Mixed severity fires created a patchy mosaic of high and low severity burns spatially and temporally (Kertis et al. 2007); not every fire was stand replacing or one fire could show varying intensity and severity during the time period it burns. Studies near the project area also show that non-stand replacing fires, a mixed severity component, have been eliminated which affects stand structure and cohorts (Tepley et al. 2013).

In addition to fire frequency and severity, fire disturbance at a landscape level is categorized into Fire Regime Condition Class (FRCC). The project area is predominately categorized as a FRCC2, meaning the area is moderately altered from the historical range of variability for fire interval (Kertis et al. 2007 and Hann et al. 2001). Fire regime and historical FRCC are used as indicators to understand fires historic and current role in the ecosystem. However, fire has not played its natural role over the past 100+ years due to settlement, fire suppression, fire fighter and public safety and forest and natural resource management. Returning or maintaining FRCC1, not suppressing fire wildfires, is not a foreseeable goal given these constraints.

The project area has a fire frequency of 1.6 fires per year (1970-2013) indicating that fire continues to occur in this area. The majority of fires are kept small (less than 10 acres) with fire suppression (data from Willamette National Forest fire reports 1970-2012).

Fuel Profile and Fire Behavior

The majority of the federal lands located in the project area are represented as Fuel Model (FM) 8, 10, and 5. In addition to these fuel models, some private lands in the project area are also characterized by FM 11 and 12.

- FM 8 represents closed canopy stands of short-needle conifers with light fuel loading and occasional concentrations of heavy fuel loading that can flare up. When fires ignite in this fuel model, fire spread is generally slow with low flame lengths. Approximately 7,099 acres of FM 8 occur in the project area.

- FM 10 is representative of mixed conifer stands with heavy concentrations of dead down wood, > 3" diameter and/or dense understory. Ground fire behavior is higher intensity than fuel model 8 because of heavier fuel loading and ladder fuels. Torching of trees (fire in the crowns of trees) occurs more frequently. Approximately 4,866 acres of FM 10 occur in the project area.
- FM 5 is representative of young timber stands with *Ceanothus velutinus* being a common brush component. Shrubs or grass are often the same height as the conifers and can carry fire at high rates of spread. Approximately 2,534 acres of FM 5 occur in the project area.
- FM 11 and 12 is representative of light to moderate slash loads often occurring from timber harvest. The continuity and amount of slash can increase fire behavior.

Fire behavior is from fuels, weather, and topography. Fire behavior was modeled using BehavePlus4 with fuels and topography inputs that correspond to the project area and summer fire weather data representing the hot, dry fire weather similar to 2009 and 2012 fire seasons.

Table 21. Existing Fire Behavior

Fuel Model	Rate of Spread* (chains/hr)	Flame Length** (feet)	Crown fire w/ % mortality	Spotting Potential (miles)
FM5 (existing condition)	65	10	Active 99***	0.6
FM10 (existing condition)	23	9	Active14	0.7
FM12 (post-harvest)	34	13	Surface 97	0.7
FM8 (post fuels treatment)****	6	2	Surface 8	0.5

* Rate of Spread (ROS) is the rate at which the head of the fire is moving or spreading (NWCG)

** Flame length (FL) is the spoken language in fire management but flame height is the referenced measurement which is measuring ground to the top of the flame vertically. Flame length measures "the length of the flame at the head of the fire measured from the middle of the combustion zone to the average position of the flame tip. Flame length is determined by the rate of spread and the intensity (heat per unit area) of the fire" (Andrews and Rothermel 1972).

*** Crown fire activity is displayed as *Active*, which means that fire is present in both the surface fuels and canopy fuels.

**** Post fuels treatment examines the fire behavior as FM8 because units would have lower fuel loading, higher CBH, and varying canopy density.

Wildland-Urban Interface (WUI)

The project area surrounds private lands along the McKenzie River, the communities of McKenzie Bridge and Rainbow, and several other groups of homes, resorts and structures. These areas are considered WUI based on the interface of forests and communities and the potential fire behavior surrounding the structures and community (USDA 2001; Silvis Lab website). The WUI interface boundary extends 1.5 miles around structures and communities (Silvis Lab website). McKenzie Bridge and surrounding communities are in Lane County and are a part of the Lane County Community Wildfire Protection Plan (CWPP) (http://www.co.lane.or.us/Planning/CWPPtoc.html).

The CWPP enables homeowners to reduce hazardous fuels within their property for wildfire protection of their homes. On private land the fuels reduction is supported through Oregon Department of Forestry (ODF). Within the project area there are also privately owned homes on leased Forest Service land and the evaluations conducted reveal these homes do not have defensible space as specified in the CWPP, *Living with Fire* (http://pnwfireprevention.com/prevention/living/) or Firewise (www.firewise.org) documents. Private homes have not been individually evaluated for this project but the boundaries between private and public land have been and defensible space or thinned forest structure to reduce wildfire impacts and risks to the residents in the project area.

3.2.4 Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Alternative 1 would not support reducing hazardous fuel loading within and around WUI areas. Through time, fuel loading would continue to increase and vegetation would continue through successional pathways. Surface fuel loading and canopy closure would continually increase thus escalating the potential for high severity wildfire across this landscape. Areas near private residences would not have any reduction in fuels to aid in reducing wildfire intensity and mitigating hazards for firefighters. FRCC would not be moved towards FRCC1, further reducing the natural forest resiliency to disturbance across this landscape. Alternative 1 would not meet the desired future conditions, reduce firefighting risks, or be cost effective due to suppression of high severity fires.

Alternative 2

Post-harvest Fuels Treatments

Harvesting increases fuel loading within stands leading to increased potential wildfire behavior in the short term (approximately 5 or more years). Following a harvest, greater hazardous fuels condition exists for 1-5 years due to red needle slash and higher fine dead fuel loads. This slash has high ignition and spread potential. Potential fire behavior would be reduced or altered with fuels treatments occurring 1-2 years post-harvest. Across the landscape the lack of variability in the horizontal and vertical fuel profile also increases the spread potential and intensity of wildfire. The proposed harvest and fuels treatments in Alternatives 2 and 3 would change the fire and fuels environment by:

- Creating safer and more cost effective protection of life, structures, and resources through reducing the risk of potential high severity fires.
- Creating variability in the horizontal and vertical profile and reduce activity created fuels to within or below Forest Plan Standard and Guideline FW-212 and 252 values of 7-11 tons/acre;
- Increasing fire tolerant conifers and reducing shade tolerant conifers through thinning and;
- Creating a mosaic and distribution of seral stages present in a mixed severity fire regime taking steps towards historic fire disturbance processes.

The proposed timber harvests would create varying amounts of timber slash in each unit. The increased fine fuel loading may reduce the success of initial attack suppression due to the fast rate of spread and larger flame lengths. Post-harvest fuels (slash) treatments would reduce the amount of fuel created from harvests to within or below maximum Forest Plan standards and guidelines for fuel loading of 7-11 tons/acre for 0-3” diameter fuel. Fuels treatments are proposed to be within 1-2 years post-harvest. The reduction in fuel loading would reduce the potential wildfire behavior and move many of the stands from FM 10, 11, or 12 to FM 8.

Table 21 displays the changes in fire behavior within the units of treatment for existing, post-harvest, and post fuels treatment conditions. Hot and dry temperatures were used for the model runs. Fire behavior that exceeds four foot flame lengths requires engines, machinery or aerial support to reduce the risks to firefighters with hand tools. In all the units where post fuels treatments take place Forest Plan Standards and Guidelines FW-212 and 252 would be met. The changes and reduction of fire behavior seen in FM10 (existing condition) to FM8 (post-harvest and fuels treatments) and also FM12 (post-harvest with no fuels treatments) to FM8 helps to support the need to reduce fuels post-harvest and also to reduce ladder fuels and vegetation continuity (FM10 characteristics) in hazardous fuels treatments.

Post-Harvest Underburning

Fire is a dynamic process that is influenced by multiple environmental factors such as wind, topography, temperature, humidity, available fuel and fuel moistures. Due to these influential factors that create and alter fire behavior, a chance exists to exceed objective parameters such as tree mortality or duff retention. Therefore, design features have been included to ensure underburns would take place during the spring or fall when the results from the burn would not exceed soil and duff and large woody debris objectives. These conditions help to retain sustainable levels of duff, soil coverage, and large woody debris often used by wildlife. Additionally, potential mortality of residual overstory trees may be reduced due to high live fuel moistures or slower burning techniques. The mortality of overstory trees for the post-harvest underburns should be kept to a minimum with an acceptable range of mortality from 0-10 percent. This range has been the approximate mortality range used over the past 10 years to maintain canopy cover for wildlife habitat and maintain stand stocking for future use.

Natural Fuels Underburn (only in Alternative 2)

Natural underburning is the proposed treatment in units 800, 810, and 820 (60 acres total including skips) in Alternative 2. There is no natural fuels underburn proposed in Alternative 3. This treatment would reduce surface fuel loading, raise canopy base height by reducing ladder fuels, and create variability in canopy density. The trees in these stands are older (120+ years) with large Douglas-fir (24+ in DBH) in the overstory. These larger older trees have thicker bark that would be able to withstand the heat associated with an underburn. Mortality would primarily be in the intermediate and understory trees; however some overstory tree mortality could occur as a result of individual or group tree torching. Anticipated mortality for these stand would be: 0-10 percent for trees greater than 17” diameter at breast height (dbh); 10-20 percent in trees 13-16” dbh; 20-40 percent in trees 7-12” dbh; and 50-100 percent in trees less than 7” dbh Fuel models of these stands should change from a FM10 to FM8 resulting in decreased fire behavior in the event of a wildfire. Burned or killed trees would not be salvaged.

All Underburns

Each prescribed burn would have an individual operation plan with specific prescription parameters that would be reviewed and signed by a silviculturalist and the line officer. In the event that fire behavior exceeds predicted parameters, burning operations would be immediately evaluated and adjusted to alter fire behavior. Underburns may require fire line to be dug to mineral soil around the perimeter of the burn unit to keep fire within unit boundaries. Fire line in Unit #740 that is visible from the Frissell trail should be re-habilitated following the burn.

All prescribed fire treatments would assist with creating variability across the landscape and underburns, specifically, would help to return fire as a disturbance process to individual stands. Prescribed fire occurs at a fine scale (stand) and not at a landscape level (project) which wildfires would naturally spread or create patches of different severity and intensity. Larger wildfires and prescribed fires would need to take place over time in order to create the full range of seral stage distribution across the landscape that is modeled under a FRCC1.

Hand or Machine Piling and Burning

Piling and burning would be on 624 acres for Alternative 2. Slash concentrations within harvest units or along roads would be piled and covered. Hand, grapple, and landing piles are covered with regulatory plastic following construction. This creates a drier pocket of fuel in the middle of the pile and enables them to be burned in the late fall or early winter when there is very low risk of the piles spreading into other fuels. Fuels would be reduced to within or below maximum Forest Plan standard and guideline levels if piling is conducted throughout the entire unit. Hand piling can be done through the entire unit however piling would be along unit boundaries or roads if entire unit is not piled. Piling along roads would help to reinforce roads as fire breaks.

Hazardous Fuels Treatments

Fuels treatments on Units 830, 840, 970, 980 and 981 (total of 180 acres) have already been implemented and completed following the final decision for Goose EA 2010. Non-commercial thinning would occur on approximately 325 acres located adjacent to private property, along Highway 126 and next to Limberlost Campground. Potential wildfire behavior would be reduced or altered by these treatments due to a decrease in surface fuel loading, reduction of ladder fuels, and variability in vegetation continuity following treatments. These changes enhance defensible space around private land and along the highway where human caused fire can result in wildfires. Following treatments, the resulting fuel profile would decrease the potential for ground fire to carry into tree canopies causing tree torching and producing embers that can land on roofs, one of the main ignition sources in the WUI.

The hazardous fuels treatments would create more defensible WUI and ultimately be a collaborative effort of public and private land owners. A reduction or change of vegetation next to homes (defensible space) or in vegetated pathways that lead to developments or structures (WUI) is important to aid State and Federal firefighters in suppression activities. The locations of Goose treatments coincide with the interface and would aid in the progress of WUI treatments in the community. Table 22 displays a comparison of fuels treatments by alternative. Alternative 2, and to a lesser extent Alternative 3, would offer the most change in hazardous fuels.

Table 22. Comparison of Fuels Treatments by Alternative

Treatment	Unit of Measure	Alt. 1	Alt. 2	Alt. 3
Post-Harvest Fuels Treatments [(1)]				
Hand Piling	Acres	0	199	43
Mechanical Treatments [(2)]	Acres	0	425	266
Post-Harvest Underburn [(3)]	Acres	0	477	178
WUI Treatments				
Natural Fuels Underburn (not including skips)	Acres	0	33	0
Hazardous Fuels Treatment (not including skips)	Acres	0	325	325
Total Fuels Treatment	**Acres**	**0**	**1459**	**812**

[(1)]: Post-harvest fuels treatments methods may change depending on feasibility and funding.
[(2)]: Mechanical treatment may include: grapple piling in slash concentrations, mastication, or any other mechanical device).
[(3)]: These acres are possible underburn acres due to dbh and location, not all acreage may be underburned. Acreage not underburned may have other post-harvest fuels treatments assigned before implementation.

Alternative 3

Alternative 3 would treat 647 acres less than Alternative 2 due to the reduction in harvest units and no natural fuels underburning. Acres treated are identified in Table 22. All fuels treatments described in Alternative 2 would apply to Alternative 3 except for the natural fuels underburns. The effects from the fuels treatments post-harvest or for hazardous fuels reduction would also be the same except for fewer acres.

Changes to the larger project level scale for FRCC is not possible given current forest resource management, fire suppression and fire not able to play its natural role. However, within the individual units, fire would support ecological processes associated with fire.

Alternative 2 and 3

McKenzie River Special Interest Area

Two hundred fifty-one acres of WUI treatments are proposed within the McKenzie River Special Interest Area (SIA). All WUI treatments would be consistent with SIA management goals to preserve exceptional scenic, cultural, biological, geological or other unusual characteristics. WUI treatments consist of thinning underbrush and ladder fuels (branches and smaller trees) and are consistent with Forest Plan direction (MA-5a-09) to suppress wildfires at the lowest acreage practicable in SIA's. WUI treatments would be consistent with the management objective to reduce the severity of wildfires and accomplish enhancement program goals to actively manage stands to reduce the potential for undesirable stand replacing fires (McKenzie River Special Interest Area Implementation Guide).

Cumulative Effects

Alternative 2 and 3

Effects to fire and fuels from actions proposed in the Goose project (Alternative 2 and 3) overlap in time and space with effects from the following past actions:

- **13 Thin**: Grapple , hand piling, and burning on approximately 44 acres; completed 2014
- **Eagle Hazardous Fuels Reductions**: piling and burning on approximately 5 acres; completed 2014
- **Goose Hazardous Fuels Reductions:** hazardous fuels reduction on approximately 180 acres; completed 2014
- **Highway 126/242 Corridor Hazardous Fuels Reduction:** hazardous fuels reduction on approximately 131 acres; completed 2012-2014.

Fuels treatments proposed under Alternative 2 would occur on approximately 1,459 acres and 812 acres under Alternative 3. These treatments, combined with the treated acres from the past actions listed above, would result in fuels reduction on 1,819 acres under Alternative 2 and 1,172 under Alternative 3. The combined treatments of the proposed project and the actions listed above would be beneficial in that more hazardous fuels would be reduced, thereby decreasing potential impacts and risks to people, structures and resources in the event of a wildfire.

3.3 Soils

3.3.1 Summary of Effects Analysis

No adverse effects to soil resources are expected to occur with use of design features and proper project implementation.

3.3.2 Scale of Analysis

For the soil resource the scale of analysis for both direct / indirect effects and cumulative effects is almost always the "unit", i.e. the stand polygon or activity area proposed for silvicultural treatment. The unit of measure for evaluating those effects is generally considered the percent of the "unit" affected. The summing of acres for various units, such as the total acres of skyline logging in a given alternative, is not an evaluation criterion for soils impacts. Impacts are evaluated on a unit-by-unit basis, and are generally the same in any given unit for all action alternatives, unless otherwise noted.

Evaluating impacts and their potential significance between or among alternatives requires a discussion of the duration and intensity of those impacts. Often various words are utilized to describe those conditions. The following definitions apply to impacts in this section.

Duration

Short-term: The effects last for a few weeks to one or two years;
Intermediate: The effects last from one or two years to about a decade:
Long-term: The effects last from about 10 years to several score years or longer.

Intensity

Low, negligible, little or no, minimal, minor: The impacts are essentially zero, at the lowest levels of detection, or very slight but still noticeable.
Moderate, reasonable: The impacts are readily apparent, but meet standards and guides.
Excessive, substantive, major, critical: The impact is moderately severe and likely approaches the upper limits of standards and guides.
Significant, unacceptable: The impacts are severe, and likely exceed standards and guides or do not meet Best Management Practices.

3.3.3 Affected Environment

This project area is located within the Headwaters McKenzie River and Quartz Creek – McKenzie River 5th field watersheds and lies completely within the Western Cascades physiographic region. More specifically, the basic rock strata in this area are basaltic andesite and andesite lava flows and flow breccias that represent younger events of the Western Cascade volcanic sequence (Walker and Duncan, 1989). These volcanic units are mapped by Walker and Duncan (1989) as "Tfc" and include strata of Miocene age or about 17 to perhaps 10 million years old. In some parts of the study area, these older Western Cascade formations are overlain by ridge capping basalt and basaltic andesite of Pliocene or Miocene age (Walker and Duncan, 1989). These volcanic rocks are mapped by Walker and Duncan (1989) as "Tb" and range from 10 to 4 million years old.

In the last several million years, these rock formations have been extensively modified by stream erosion and mountain glaciation, especially with Pleistocene to Holocene glacial activity. Glacially derived soils are common in many units within this project. Ice cap glaciers probably covered the High Cascade platform many times during the Pleistocene, sometimes with sheets of ice hundreds of feet thick. During the early and most extensive glacial periods, valley glaciers surged away from the large ice mounds along the Cascade crest and traveled south and west down the McKenzie River drainage or north and northwest out the South Fork drainage, as they acted as outlets for excess ice accumulation for the large ice platforms along the Cascade crest.

The rocks and glacial deposits of these younger Tertiary volcanic strata and Pleistocene drift, moraine, and fluvioglacial material are generally quite stable in this project area. Because of extensive glacial scour, most volcanic rocks are usually not well weathered at this point. Residual soils are often relatively coarse grained, occasionally rocky, and usually contain few clays. Soils developed from glacial deposits, even on the steeper side slopes, are usually quite stable. Consequently, because of the gentle side slopes in the valley bottoms, the lack of very fine soil particles in most areas, especially the glacial and outwash soils, and the fact that glacial scour removed deeper pockets of fine-grained soils on much of the steep terrain, most soils are quite stable. These various volcanic land types are generally well drained where permeability is rapid in the surface soil and moderately rapid in the subsoil. As well, the glacial and alluvial soils in the valley bottoms are very well drained, and permeability is rapid to very rapid in both the surface soil and subsurface soil layers. Because of high infiltration rates in the broad valley bottoms, overland flow is generally uncommon. In the proposed units, side slopes range from near zero to about 30 percent on the gentler slopes to 40 to 80 percent on the steeper terrain. Offsite erosion is generally not a concern because of the vegetative ground cover, the high infiltration rates, and the gentle to moderate side slopes for many units.

Most of this project area was burnt by either natural or aboriginal fires that were likely prevalent and carried through much of the project area in the last several hundred years. Many areas may have been under burnt instead of stand replacement. Consequently, natural accumulations of down woody debris may not have been prevalent in many parts of this project area. These conditions would vary across the landscape, depending on aspect, elevation, and slope position.

3.3.4 Environmental Consequences

Direct and Indirect Effects

The major short-term effects to soil productivity from harvest activity, as discussed in the Willamette National Forest Final Environmental Impact Statement (FEIS 1990), include management indicators of displacement, compaction, nutrient loss, and instability (Table 23). The total area of cumulative detrimental soil conditions should not exceed 20 percent of the total acreage within the activity area, including roads and landings.

Table 23. Management Indicators for Assessing Effects to Soils

Issue	Management Indicator	Justification
Displacement	50 percent of topsoil or humus enriched soil horizons are removed from an area of 100 square feet that is at least 5 feet in width	FW-081
Compaction	Increase in soil bulk density by at least 15 percent and/or a reduction in macropore space of 50 percent over the undisturbed soil	FW-081
Nutrient Loss	Insufficient duff retention or large woody material to ensure adequate nutrient cycling	FW-085

Issue	Management Indicator	Justification
Instability	Increase in size, intensity or number of slope failures	FW-086

Alternative 1 – No Action

Stands would continue to develop. Many of the stands proposed for treatment currently have little understory vegetation because of the lack of sunlight to the forest floor. Intermediate and suppressed trees would slowly be removed from the stand through mortality and decay. In areas already compacted or disturbed by the initial entries, the soil building process would continue to return the soil to near pre-harvest conditions in the longer term. Short-term to intermediate term impacts from harvest, such as soil disturbance, dust (or mud), slash accumulation and disposal, and longer term impacts such as compaction and nutrient loss would not occur. Slope instability is not a geologic process that is generally active in this project area. Consequently, no effects to slope instability are anticipated whether the units are managed or not.

Alternative 2 and 3

Effects between both action alternatives would be the same except for acreage harvested. The major short-term impacts to soil productivity from harvest activity include displacement, compaction, nutrient loss, and instability. Forest-wide (FW) Standards and Guidelines (FW–081), state that the total area of cumulative detrimental soil conditions should not exceed 20 percent of the total acreage within the activity area, including roads and landings. In most situations, preventing soil impacts is the most effective and feasible way of reducing cumulative effects and ensuring long-term soil productivity. All prescriptions or design features discussed are designed to meet or exceed the requirements outlined in the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA, 2012).

Anticipated direct effects to the soils resource would be within Willamette National Forest Standards and Guidelines. Recommended suspension requirements would control the potential for unacceptable displacement. Most areas with side slopes less than 30 percent have been prescribed for ground based yarding systems. Compaction would be controlled by designated skid or forwarder roads, the use of existing roads as much as possible, and subsoiling. Skyline yarding with one end suspension has been prescribed for units or portions of units with side slopes greater that 30 percent to avoid excessive disturbance from heavy equipment. Potential nutrient loss would be controlled by duff retention standards. Slope stability would be maintained by deleting those areas or units where harvest could result in unstable soil conditions. For the most part, slope instability is not considered a concern in this project area. Potential cumulative effects from displacement, nutrient loss, and instability with previous management were not observed in the field reconnaissance, or those units were deleted from the project.

The primary previous impact to the soil resource from management is compaction, the effects of which can remain apparent for decades. The field investigation indicated that Unit 410 exceeded the Willamette National Forest FW-081 Standard of 20 percent of an activity area impacted by compaction. In addition, Unit 100 closely approached the standard. The remaining units were sufficiently within the standard.

As mitigation in Units 100 and 410, all landings, temporary haul or primary skid roads utilized by the purchaser/logger would be subsoiled to a depth of 18 to 24 inches at the completion of logging activities. Additional enhancement subsoiling is required for heavily compacted areas not utilized by the Purchaser in these units. Subsoiling of landings and temporary roads or primary skid roads is required in all ground based units to ensure that cumulative levels remain well below the 20 percent standard outlined in the Forest Plan. Some post-sale enhancement subsoiling is recommended for areas not utilized by the Purchaser in units that are approaching the 20 percent compaction standard. Monitoring of post-harvest subsoiling on similar projects with similar activities, indicates overall compaction is reduced by 4 to 10 percent from initial levels. The recommended subsoiling method is by “munching” (lifting and breaking up compacted soil layers with an excavator) in order to reduce potential impacts from root pruning, to avoid concentrations of slash or down woody debris, and to reduce disruption from boulders or stumps.

One of the goals with entry into all the units is to provide the opportunity to subsoil the existing skid roads as much as is practical in order to reduce compaction to lower levels. The objective is to remain below the 20 percent cumulative level, maintain long term soil productivity, and provide a level of erosion control that is consistent with Forest plan and State guidelines. With entry into any ground-based unit, evident skid or haul roads would be utilized before any new skid road is approved. All ground based yarding would require that either C6.41 and/or C6.42 (predesignated and preapproved / LTSR) contract clause(s) on ground based portions be strictly adhered to, and/or line pulling and directional falling would be implemented, as appropriate.

Skyline operations in thinning units with small wood and intermediate supports usually impacts less than 1 percent of the unit area. Skyline yarding with one end suspension is proposed for parts or all of many units. Most of these units had low existing compaction levels at generally less than 5 percent, at least in the areas of steeper side slopes. Skyline landings are primarily planned at old existing landings, road turnouts, and road junctions. Little new spur road would be required. Consequently, cumulative effects from existing compaction and skyline yarding are not anticipated for any individual unit.

Potential nutrient loss is primarily controlled by duff retention standards. Duff retention is the amount of duff thickness remaining after management activities are completed. Duff retention objectives would be specified for each unit to maintain nutrient cycling. Duff retention values range on the low end from 10-30 percent to as much as 60 to 80 percent on sensitive slopes. Monitoring and field reconnaissance in recent years has shown that the duff retention percentages for under burns in partial cuts, thinning, or fuels reduction within unmanaged stands, which maintain an intact live root mat and live canopy cover over most of the unit, could be lower and still achieve adequate soil protection.

For all action alternatives, within the managed plantations, slash would be scattered in the units, piled and burned, or perhaps broadcast or under burned. Piling may occur by hand or with a grapple machine. Grapple piling occurs with a grapple not with a dozer brush rake. Grapple piling requires only one pass of the machine across the landscape, and the machine works while sitting on slash. Extensive monitoring of grapple machine piling operations indicates that little or no additional compaction or displacement occurs, when properly implemented. In many cases only a few acres of any particular unit are hand piled or machine piled.

Burning the piled slash may develop sufficient heat to affect the underlying soil. However, the hotter portions of pile burning involve only a very small part of the acreage in any unit, usually less than 1 percent of the area. Also pile burning is usually done in the fall or winter months when duff and soil moistures are higher, and this helps reduce the downward heat effects to the soil. Consequently, pile burning is considered a minor effect and not cumulative because of the limited overall acreage involved.

Another aspect of long term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. Management activities would be planned to maintain enough large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085). At this time, site specific needs would be considered commensurate with wildlife objectives as outlined in FW-212a and FW-213a (as amended). Concentrations of larger down logs that were produced with the initial harvest should be left undisturbed as much as possible. Consequently, with the retention of adequate duff and woody debris, potential adverse impacts to long-term soil productivity are not anticipated.

This portion of the Upper McKenzie drainage on the McKenzie River Ranger District primarily contains stable, productive soils. Active slope instability from either debris chutes or slump / earth flow complexes does not usually occur. Two small proposed units are to be deleted from project consideration because of numerous existing debris chute concerns, and the northern boundary of Unit 250 would need to be moved down the hill to avoid potentially highly unstable soil areas. Soils / Geology personnel should assist in the layout of this unit. The recent intense rainstorms from 1996 to 2000 generated one in-unit, instability within this project area. This failure, found in Unit 10, is a result of excessive saturation from road drainage and not a function of inherent slope instability of the soils in the unit. Given the sideboards in the discussion above, potential slope instability with proposed management is not considered a concern in any other unit.

Cumulative Effects

The primary previous impact to the soil resource from management is compaction, the effects of which can remain apparent for decades. Potential cumulative effects from displacement, nutrient loss, and instability with previous management were not observed in the field reconnaissance, or those units were dropped. Existing compaction levels have been documented and discussed for the various units. The impacts are evaluated on a unit-by-unit basis, and are generally the same in any given unit for all action alternatives, unless otherwise noted. The soils design criteria are designed to limit the amount of additional compaction, and the subsoiling is intended to reduce compaction where levels would exceed standards and guides. It is possible that some ground based units may approach or exceed the 20 percent standard at the completion of yarding, grapple piling, and pile burning. Specifically, Units 100 and 410 have subsoiling as a mitigation to insure compaction is reduced to more acceptable levels. In addition for most ground based units, some Purchaser subsoiling is recommended as enhancement to lower compaction amounts further. The objective is to remain below the 20 percent cumulative level, maintain long-term soil productivity, and provide a level of erosion control that is consistent with State guidelines.

Prescriptions for soil protection and watershed considerations take into account past and predicted future land management activities. No single unit measure of long-term soil productivity is widely used. Information on the survival and growth of planted seedlings may indicate short-term changes in site productivity. However, the relationship of short-term changes to long-term productivity is not fully understood. Experience indicates that the potential impacts on soils are best evaluated on a site-specific, project-by-project basis. The major soils concerns—compaction, nutrient loss, displacement and instability—are most effectively reviewed for short- and long-term effects at the project level. With proper project implementation, unacceptable cumulative effects on soils are not anticipated from the action alternatives.

3.4 Water Quality and Aquatic Resources

3.4.1 Summary of Effects Analysis

The riparian vegetation and large woody material that provide for aquatic and terrestrial habitat complexity and productivity have been altered by past logging practices, road construction, private development, and recreation throughout much of the project area. There is a lack of vegetation species diversity and structural complexity at the landscape and project scales. In general, the habitat elements that contribute to quality fish and wildlife habitat and productivity are in a somewhat impaired condition, primarily due to the presence of dams, the increasing development along river corridors, the removal of large woody material from the streams and floodplains, and lack of vegetation diversity. These conditions need to improve in order to meet Aquatic Conservation Strategy (ACS) Objectives (Appendix E) and support healthy, native fish and wildlife populations in the watershed.

Alternative 1 would have no immediate effect on the current conditions. Desired riparian conditions – high species and structural diversity with large dead and down wood – would slowly develop over time (several decades) and depend solely on natural thinning events (stem exclusion mortality and disturbance). Active restoration of riparian stands that currently do not meet (ACS) Objectives would not occur. In addition, the currently dense riparian stands would be at greater risk to high severity fire, insect infestation, and disease – all carried more efficiently through overstocked stands. Alternative 1 would result in little or no change to impaired habitat conditions for fish and other aquatic species.

Alternative 2 would commercially thin 138 acres of Riparian Reserves to reduce the density of overstocked riparian stands, increase species diversity and structural complexity, and accelerate tree growth to more quickly attain ACS Objectives. This alternative would largely protect future in-stream wood sources, due to no-treatment buffers, but may reduce short-term (1-2 decades) sources of small dead wood in the outer portions of some Riparian Reserves in order to achieve desired vegetation characteristics. However, wood values would remain within the range of natural variability and abundant overstory would be retained for future wood input sufficient to sustain physical complexity. Direct management actions would create dead and downed wood within some Riparian Reserves. Sedimentation potential would increase during harvest activities but decrease after harvest due to road upgrades, decommissioning, and storage. The risk of sediment delivery through culvert failure would be reduced due to culvert installation, replacement, and drainage improvement. Due to project design features, protection measures, and enhancement treatments, Alternative 2 would result in beneficial changes to habitat conditions for fish and other aquatic species.

Alternative 3 would have similar effects as Alternative 2 with minor differences. Fewer units would be harvested and therefore only 57 acres of Riparian Reserves would be treated and fewer roads would be upgraded. Due to project design features, protection measures, and enhancement treatments, Alternative 3 would result in beneficial changes to habitat conditions for fish and other aquatic species , but not as much as Alternative 2.

Alternative 2, with potentially the largest impact, was evaluated for effects on ESA- listed fish, bull trout and spring Chinook salmon, and their designated Critical Habitat. Potential project effects on population, habitat and non-habitat indicators were evaluated. Although some project activities may have minor adverse effects at the site scale, the effects to their habitat are considered to be either insignificant or discountable. The effects determination is described as May Affect, Not Likely to Adversely Affect Upper Willamette River spring Chinook salmon and Columbia River bull trout and their designated Critical Habitat.

3.4.2 Scale of Analysis

Unless otherwise noted, the geographic scale used to assess direct, indirect, and cumulative effects to water quality and aquatic resources for this project includes the project area units, the project area, the Florence Creek-McKenzie River and Lost Creek 6^{th} Field Sub-watersheds within the Headwaters McKenzie River 5^{th} Field Watershed, and a small portion of the Elk Creek-McKenzie River 6^{th} Field Sub-watershed within the Quartz Creek-McKenzie River 5^{th} Field Watershed (Figure 16).

3.4.3 Assessment Methodology

Data on current and historic watershed condition was gathered from the Upper McKenzie Watershed Analysis (1995) and through GIS analysis of a USFS vegetation database (FSVeg) and high resolution satellite imagery (WorldView2).

At the beginning of the project all potential units were surveyed by fisheries, hydrology, wildlife, and botany specialists. Each unit was gridded to capture streams, springs, wetlands and other waterbodies that may not be mapped on the GIS layer. When waterbodies were found, they were mapped with GPS devices all the way through the unit and down to their terminus with another waterbody. Notes on each waterbody commonly include, but are not limited to: stream class and presence of fish, stream width, dominant substrate, stream gradient, surface connection (or lack of) to another waterbody, size and abundance of functioning large woody material (LWM) in channel (i.e. forming pools, retaining sediment), and characteristics of adjacent riparian stand (e.g. diameter of trees, amount and diversity of understory vegetation, amount of hardwood species).

Based on stream and riparian characteristics, a recommendation was made for no-treatment buffers and other potential treatments (e.g. down wood creation) for each waterbody. After surveys were conducted individually, fisheries, hydrology, wildlife, and botany specialists met as a team to discuss findings and come up with an integrated Riparian Reserve management plan for each unit.

3.4.4 Affected Environment – Riparian Conditions

The portion of the project area within the Florence Creek-McKenzie River and Elk Creek-McKenzie River Sub-watersheds is located in the Western Cascades Geological Province and marks the lower extent of Pleistocene glaciations in the McKenzie River Sub-basin. The porous glacial deposits are hundreds of feet deep providing a low gradient barrier between the McKenzie River and the steep slopes above and thus infrequently allow tributary channels to make surface water connection to the McKenzie River. Much of the Lost Creek Sub-watershed drains gently sloping terrain of the High Cascades and has a large water storage capacity contributing to a stable, even flow regime. In general, the streams within the project area drain into the McKenzie River where public drinking water is one of the beneficial uses.

Most of the streams throughout the project area are moderate to high gradient (> 2 percent) first to fourth order streams. Boulders and large wood are key components found in these types of step/pool channels. Primary streams within the Florence Creek-McKenzie River and Lost Creek Sub-watersheds include the McKenzie River and Lost Creek as well as small tributaries – Florence Creek, Goose Creek, Powers Creek, Glen Creek, White Branch, and various unnamed streams. Figure 16 shows the location of streams within the project area and sub-watersheds. The 1964 and 1996 floods had complex effects on stream channels and riparian areas. Evidence of channel aggradation, bank failures, diverted channels, and altered riparian areas can be seen throughout the project area. In recent years, the channel conditions have been relatively stable.

The project area has been shaped by fires as well as timber harvest within the last 100 years. Fire records show that there have been four fires within the planning area, two Sims Ranch Fires, North McKenzie Fire, and South McKenzie Fire. All produced stand replacing fires with very few residual trees left within the stands. With no records to suggest otherwise, the stand replacing fires are believed to have been regenerated naturally with predominantly Douglas-fir. Many of these fire regenerated stands do not show signs of active management since the stands regenerated, however many of the stands do have residual stumps where either salvage logging or selective harvest has taken place over the last century.

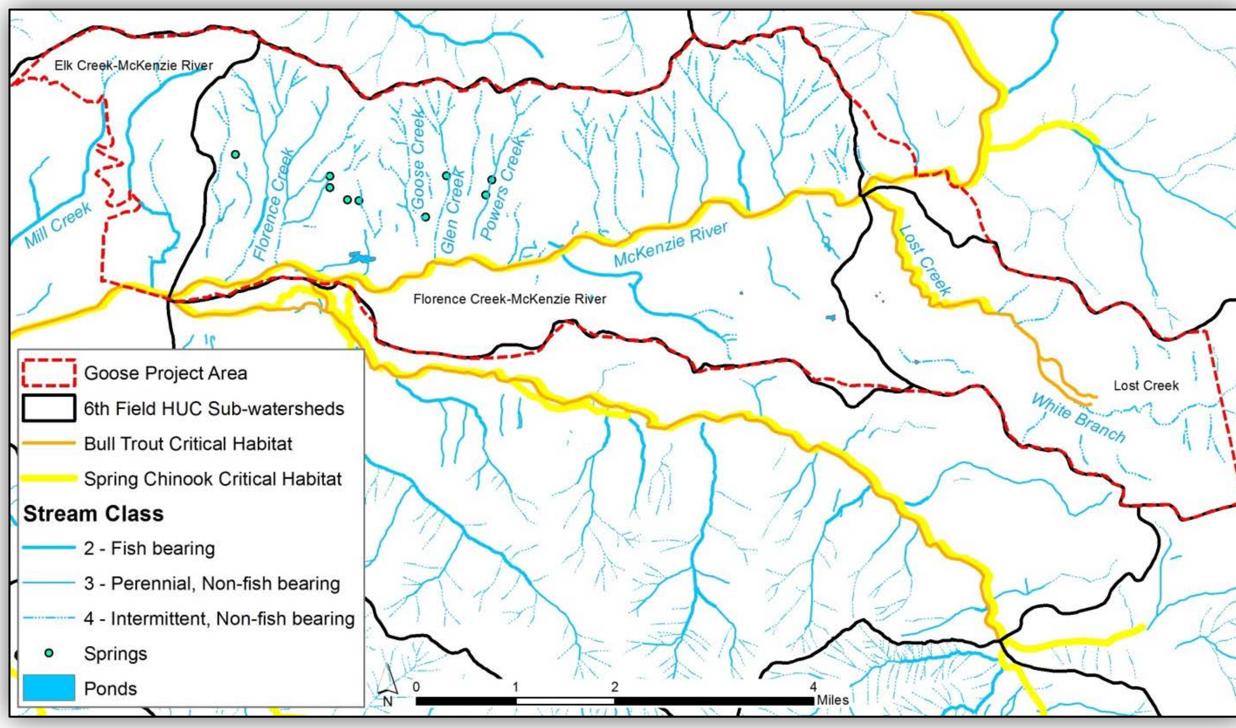

Figure 16. Waterbodies, 6th Field HUC Sub-watersheds, and ESA-Threatened Bull Trout and Spring Chinook Salmon Critical Habitat within the Project Area

Road construction and timber harvest began in the project area in the 1940s, peaking on National Forest system lands in the 1970s and 80s. Much of this activity that occurred prior to implementation of the Northwest Forest Plan resulted in removal of riparian vegetation that provided large wood and shade to the small tributary streams in the project area. Some Riparian Reserves were clear-cut and replanted with Douglas-fir. As a result, many of these stands were set on a management-induced trajectory that has led to artificially dense, conifer-dominant stands, with tree densities above the natural range of variability expected in this area. Recent forest research in the Coast Range and Western Cascades indicates that existing old growth stands developed with natural stand densities of 40 to 60 conifers per acre (Tappeiner et al. 1997; Poage and Tappeiner 2002). Stand densities in the project area range from 79 to 362, with an average of 189. Additionally, Pollock et al. (2005) found that “riparian stands often develop in a much more open structure, such that stem exclusion is much less common and understory vegetation usually is present throughout the development of a forest.” The existing lack of complexity and diversity may be limiting nutrient cycling, deciduous organic matter input to waterbodies, and habitat for riparian-dependent wildlife.

The Riparian Reserve along the McKenzie River includes sections of paved roads, aggregate roads, and consists mostly of private land and residences. There are pockets of mature forest, but most of the land has been impacted by management and recreation. The Lost Creek Riparian Reserve consists of mostly forest land with some private land and recreational impacts. Private land, residences and roads along the McKenzie River corridor through the project area have impacted large wood recruitment. Heavy boater recreation along the McKenzie River has led to the removal of wood that presents safety hazards. A study conducted by Minear (1994), found that there has been a reduction in pool forming elements (i.e. large wood) in the McKenzie River and noted a 19 percent decrease over the study area since 1938. Recent wood counts in the McKenzie River average about 10 pieces per mile; this is considered very low abundance. A stream survey conducted on Lost Creek in 2003, counted 25 pieces of large woody material per mile. Smaller pieces were more abundant. This may be due to a large fire in the past century that burned stream adjacent conifers along most of the length of Lost Creek. Little is known of wood counts in the streams within project area units since few are fish-bearing and are not typically surveyed using the standard USFS protocol. Field surveys were conducted in all proposed units, but these surveys provided only an estimated size range of “pool forming” wood and an estimated range of abundance.

Fire has been suppressed in the Upper McKenzie watershed for over 100 years and there is evidence of a lack of early-seral vegetation. Within Riparian Reserves, there is currently <2 percent early-seral vegetation (<20 years old) and the natural range of variability is 3-30 percent. A large component of early-seral vegetation is deciduous and herbaceous, particularly within riparian areas (Gregory et al. 1991). In the western hemlock plant series, which makes up most of the project area, redstem ceanothus and snowbrush – both deciduous shrubs – tend to dominate early-seral stands, along with beargrass, fireweed, big leaf huckleberry, and bracken fern (Upper McKenzie Watershed Analysis 1995). In addition, there are three dams – Carmen, Smith, and Trail Bridge – in the Upper McKenzie watershed that have greatly diminished flooding in the McKenzie and Smith Rivers. The elimination of this disturbance has also contributed to a decline in early-seral vegetation within Riparian Reserves (Minear 1994).

Within the project area, late-seral vegetation is currently at the lower end of the natural range of variability (Upper McKenzie Watershed Analysis 1995). In late-seral stands, shrubs and herbs are re-initiated as conifers die and create gaps in the canopy. Late-seral understory species include twinflower, vanilla leaf, dwarf Oregon grape, and big leaf huckleberry. In the Douglas-fir plant series, understory vegetation is often comprised of golden chinquapin, oceanspray, salal, dwarf Oregon grape, whipple vine, and grasses. A recent study of riparian plant communities in northwest Oregon (McCain 2005) provides data on “relatively unmanaged” conditions. In this study, a total of 441 sites in the west Cascades were surveyed, with many of the Willamette sites on the McKenzie River Ranger District. The study describes riparian and upland plant communities based on geomorphic features (e.g. in-channel, cobble bars, terraces, floodplain, etc.). On the “steep banks/terraces” and “high terraces/major floodplain” features (common to streams in the project area), deciduous trees had typical percent cover values of 15-64 percent. Additionally, valley cross-sections (300-foot riparian transects) on 3rd and 4th order “relatively unmanaged” streams in the west Cascades had a hardwood basal area of 7-16 square feet/acre and hardwoods were present throughout the 300-foot transect. This study suggests that in “relatively unmanaged” riparian plant communities, there is typically a hardwood, shrub, and herb component. These deciduous and herbaceous species provide many benefits to riparian and aquatic ecosystems, including better food resources and higher productivity for aquatic invertebrates compared to conifer-dominant systems (Sedell and Dahm 1984; Webster and Benfield 1986; Romero et al. 2005; Allen 1995; Wipfli 1997; Wipfli and Gregovich 2002; Cummins 2002; Allan et al. 2003; Musselwhite and Wipfli 2004; Wilzbach et al. 2005; Kiffney and Roni 2007); increased nitrogen fixation, organic matter cycling, and soil fertility (Compton et al. 2003); and wildlife benefits. Figure 17 illustrates desired conditions for late-seral Riparian Reserves.

Figure 17. Desired Conditions for Late-seral Riparian Reserves

Based on the fact that there is a lack of both early- and late-seral vegetation classes that have a large deciduous and herbaceous component, it follows that these species are underrepresented on the current landscape. This is further supported by analysis of existing vegetation using high resolution satellite imagery. WorldView 2 imagery has eight multispectral bands including the Red-Edge band, which improves the accuracy of remotely sensed plant studies. The analysis is based on the fact that chlorophyll in living plant material strongly absorbs visible light and strongly reflects near-infrared light. Because deciduous vegetation has higher chlorophyll production than conifers, the imagery helps distinguish between coniferous and deciduous vegetation. A commercial computer software program called eCognition is then used to generate polygon boundaries around the different vegetation types distinguished in the WorldView 2 imagery. The polygons were then classified into eight different classes: conifer dominant, deciduous tree (>2 meters tall) dominant, deciduous shrub (<2 meters tall) dominant, mixed conifer and deciduous, large wildfires since 2011, water, snow or glacier, and other (non-forest, bare ground, grass, etc.). Based on results of this analysis, approximately 86 percent of Riparian Reserves in the Upper McKenzie watershed are conifer dominant and only 1 percent are deciduous dominant (trees and shrubs).

Approximately 2 percent are mixed conifer and deciduous, 3 percent are within a recently burned area, and 8 percent are non-forest. Figure 18 shows the classified vegetation for the entire Upper McKenzie Watershed. Within the project area, approximately 77 percent of Riparian Reserves are conifer dominant; 3 percent are deciduous dominant (trees and shrubs). Approximately 15 percent are mixed conifer and deciduous, which occur primarily in late-seral stands along the McKenzie River. Figure 19 shows the classified vegetation for Riparian Reserves within the project area. The results of this landscape-scale analysis reveal a very low abundance of deciduous species and are corroborated by surveys at the stand scale, where dense conifers dominate Riparian Reserves and there is often a lack of understory development and species diversity. Figure 20 illustrates typical overstocked stands in the project area.

Some portions of Riparian Reserves within the project area have higher structural and species diversity and are providing adequate stream shade, root strength and bank stability, sediment filtration and nutrient cycling, large wood supply to waterbodies and floodplains, organic matter input to waterbodies, and habitat for riparian-dependent wildlife. Figure 21 illustrates properly functioning conditions within Riparian Reserves in the project area.

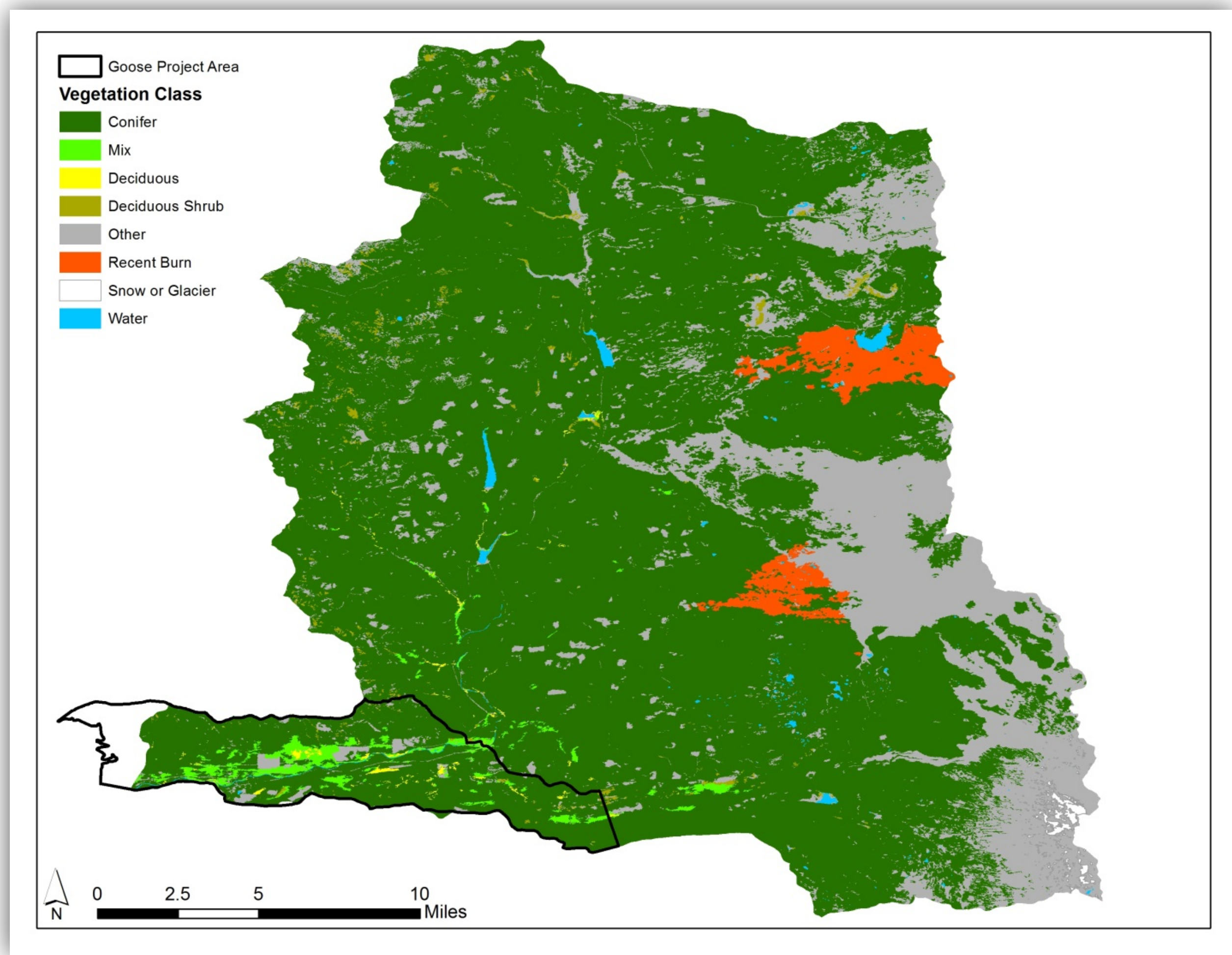

Figure 18. Vegetation Classification of the Upper McKenzie Watershed*

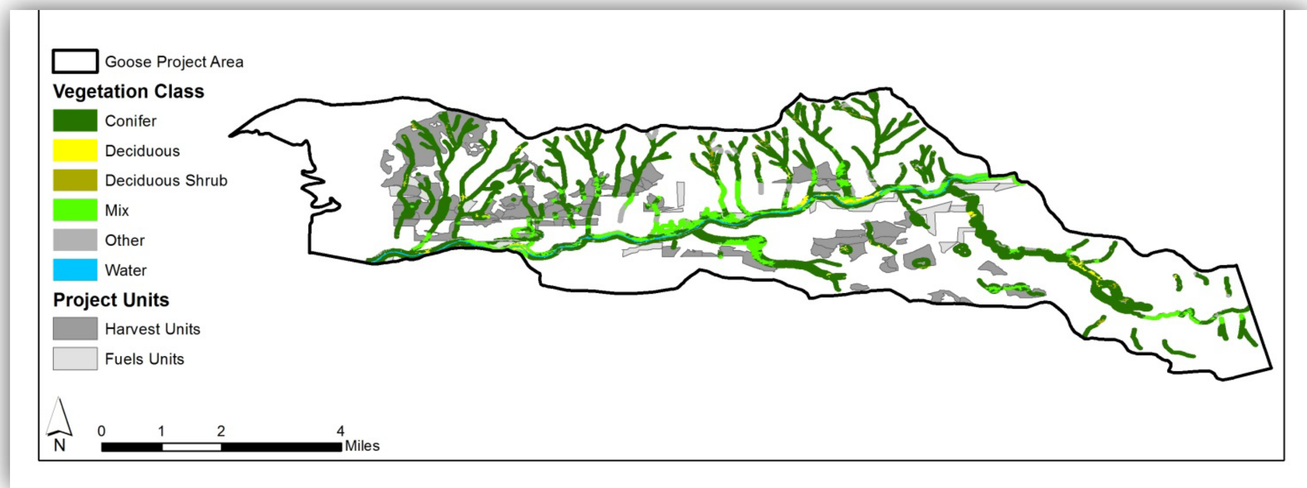

Figure 19. Vegetation Classification within Riparian Reserves of the Project Area*

The overall lack of deciduous and herbaceous vegetation may be impacting stream ecosystems. Nutritional energy becomes available to the stream community from two main sources: photosynthesis by aquatic plants in the stream itself (autochthonous sources) and decomposition of organic matter imported from outside the stream (allochthonous sources). The mix of energy sources has a major influence on the structure and function of stream ecosystems. Streamside vegetation provides large quantities of organic matter in the form of leaves, needles, and woody material. Leaves and needles usually contribute most of the readily usable organic matter in woodland streams (Murphy and Meehan 1991). Leaves and needles need to be conditioned by microbes for about 30 days before invertebrates will consume them. Conditioning increases concentrations of nutrients in leaf detritus because microbes use nitrate and phosphate from stream water and carbon compounds from the leaf to build their own proteins thereby decreasing the C:N ratio of the detritus. Most animals require food with a carbon:nitrogen (C:N) ratio less than 17:1. Almost all forms of allochthonous organic matter have a C:N ratio higher than 17:1 so they require microbial processing to enhance food quality. The quality of various forms of organic matter varies widely as measured by the C:N ratio or the percentage of lignin. At the low quality end of the spectrum are woody debris and conifer needles and at the high quality end are periphyton, macrophytes, and fast-decaying deciduous leaves. Table 24 shows the nutritional quality of various types of organic matter in increasing order.

Figure 20. Overstocked, Conifer-Dominant Stand in Riparian Reserves in the Project Area

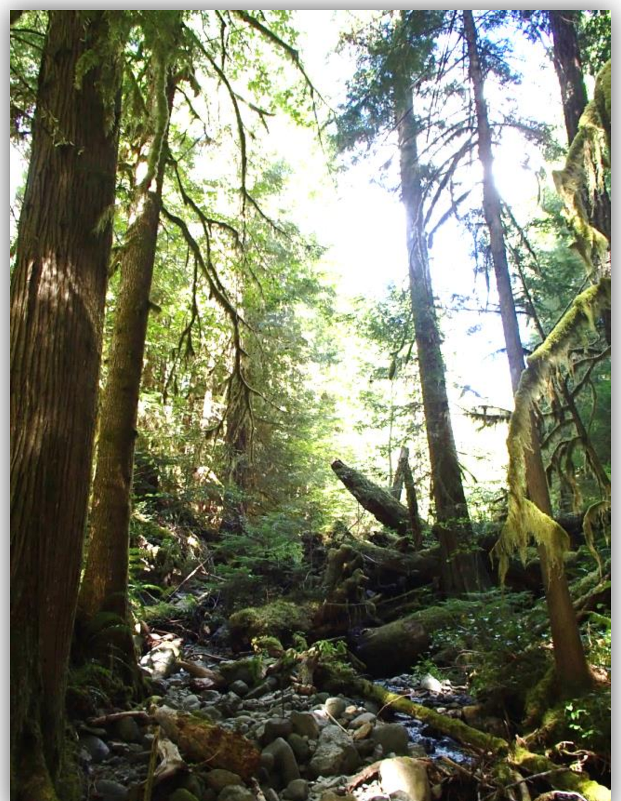

Figure 21. Properly Functioning Riparian Reserves in the Project Area

Table 24. Nutritional Quality of Various Types of Organic Matter (based on Murphy and Meehan 1991)

Type of organic matter	C:N ratio	Lignin (%)
Woody debris (Douglas-fir)		
Wood	1,343:1	48
Bark	324:1	10
Twigs	235:1	34
Needles	97:1	14
Leaves		
Vine maple	77:1	8
Big-leaf maple	62:1	17
Red alder	23:1	10
Aquatic macrophytes	8:1	
Periphyton	1-11:1	

In summary, the riparian vegetation and large woody material that provide for aquatic and terrestrial habitat complexity have been altered throughout much of the watershed and project area due to: clearcutting and replanting to single species monocultures; removal of hardwoods from riparian areas; removal of in-stream wood; replanting to create overstocked conditions; and removal of fire disturbance mechanism. Based on data gathered through landscape and stream reach assessments, it was determined that current conditions in some portions of the Riparian Reserves are outside the natural range of variability and are not meeting desired vegetation characteristics needed to attain ACS Objectives. Though the trend is slow, the overall aquatic habitat is improving in the project area as the riparian vegetation recovers towards more natural conditions.

3.4.5 Environmental Consequences – Riparian Conditions

Direct and Indirect Effects

Alternative 1 – No Action

Current rates of large wood recruitment, provided mostly by stem mortality (from competition, disease, wind and snow downed trees) and bank erosion, would be maintained. Alternative 1 would provide a slightly higher rate of in-stream wood recruitment compared to the action alternatives. Where the action alternatives protect about 90 percent of the wood recruitment zones, the No-Action alternative would protect 100 percent. In some streams, recruitment trees are of sufficient size to meet ACS Objectives, but in other streams with small diameter riparian stands the aquatic benefit is limited, namely through the reduced ability to store sediment and organic matter and contribute to habitat forming processes (e.g. scour). Though small wood has some value, particularly in the smaller headwater reaches, the longevity of recruited small diameter trees is short-lived, as they break down through abrasion and decomposition more rapidly compared to large trees. Small diameter trees are also more likely to be transported out of the system. In-stream wood abundance is low for most streams in the project area and is largely due to the lack of large enough wood to remain stable in channels.

The No-Action alternative would not accelerate desired vegetation conditions. Desired riparian conditions – high species and structural diversity with large dead and down wood – would slowly develop over time (several decades) and depend solely on natural thinning events (stem exclusion mortality and disturbance). Without management to increase the abundance of deciduous and herbaceous vegetation in dense, conifer-dominant stands, ecosystem productivity would remain at relatively lower levels. Accelerated restoration of riparian stands that currently do not meet ACS Objectives would not be accomplished.

In addition, the currently dense riparian stands would be at greater risk to high severity fire, insect infestation, and disease – all carried more efficiently through overstocked stands. Although these are natural disturbance processes that contribute to forest habitat and diversity, a large disturbance event, or one of high severity, has the potential to reduce vegetation, large woody material, and stream shade across large areas of Riparian Reserves. Research conducted in the Pacific Northwest has shown that while fire severity may be lower along perennial streams due to relatively cool and moist conditions, fire severity along intermittent streams can be similar to adjacent upland areas (Tollefson 2004). In fact, under some circumstances, riparian areas can become corridors of increased fire spread (Pettit 2007).

Alternatives 2 and 3

The Northwest Forest Plan (NWFP) prohibits timber harvest in Riparian Reserves except as needed to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS Objectives (NWFP Standards and Guides, TM-1(c)). Based on data gathered through landscape and stream reach assessments, it was determined that current conditions in some portions of the Riparian Reserves are outside the natural range of variability and are not meeting desired vegetation characteristics needed to attain ACS Objectives. Therefore, there is a need to treat parts of the Riparian Reserves to accelerate attainment of desired conditions. Other areas, however, are currently meeting desired vegetation characteristics and treatment is not necessary. In some cases, maintaining and/or restoring each one of the ACS Objectives can be a balancing act with trade-offs. For example, to meet the riparian vegetation objectives ("species composition and structural diversity of plant communities" and "habitat to support well distributed populations of native plant, invertebrate and vertebrate riparian dependent species") in young, dense conifer stands, a common silvicultural tool is to remove overstory density to encourage understory growth and structural development. Removal of overstory density, however, could potentially lead to increased thermal loading or reduction of wood volume available for recruitment. Because of these trade-offs, conflicting objectives were carefully balanced based on characteristics of each waterbody and adjacent riparian area.

The body of literature on wood recruitment zones is considerable. Wood recruitment zones vary from as little as 8m (26 feet) up to about 45m (148 feet) depending on various factors (Benda and Bigelow 2014, Spies et al. 2013). According to Benda and Bigelow (2014), wood source areas are highly variable, but are strongly correlated to tree height and the dominant wood recruitment process for each stream reach. In their study, they found that in managed forests of the Cascades Range, where bank erosion and tree mortality are the dominant wood recruitment processes, 90 percent of in-stream wood originated from within about 8 meters (26 feet) of stream channels and the remaining 10 percent is supplied from a distance equivalent to one tree height. Figure 22 shows the source distance curves for wood in Benda and Bigelow (2014). In less managed and unmanaged forests, 90 percent of in-stream wood originated from about 13 meters (43 feet) of stream channels.

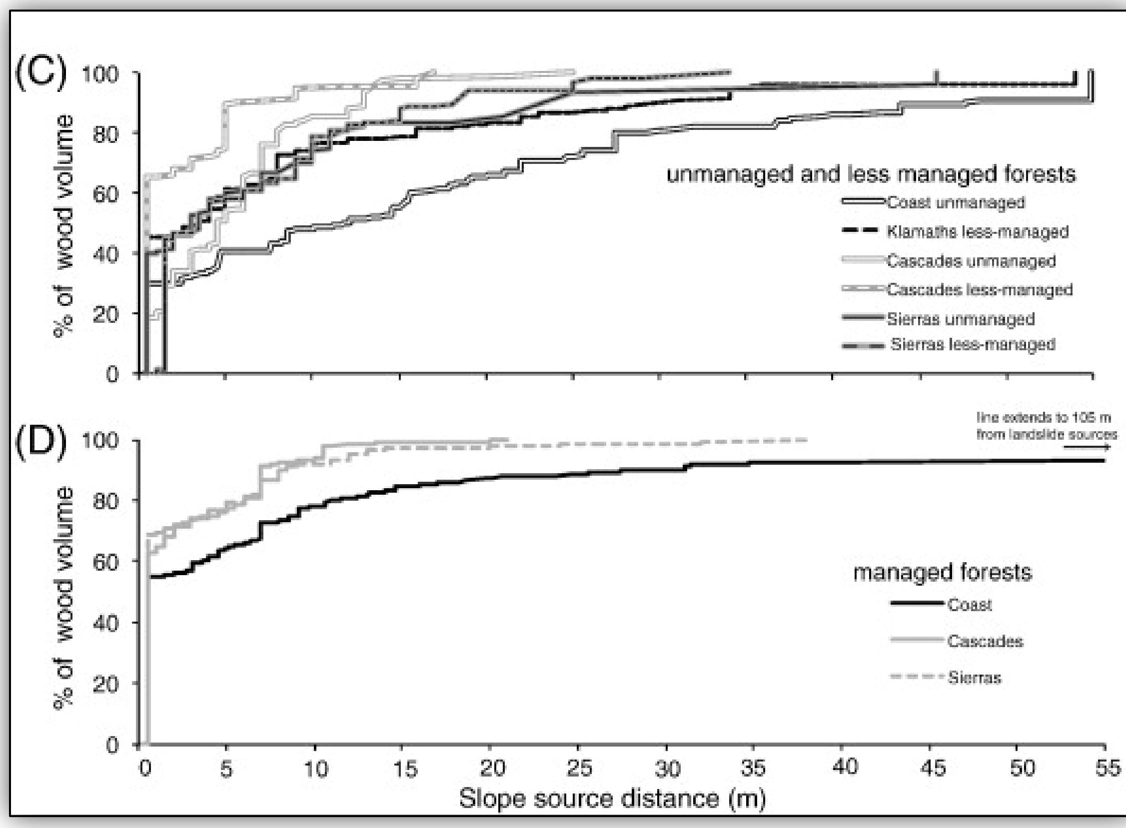

Figure 22. Source Distance Curves for Study Area (Brenda and Bigelow 2014)

In Meleason et al. (2003), the simulation model OSU STREAMWOOD was used to evaluate the potential effects of different riparian thinning scenarios on wood recruitment to streams over time. In one scenario, they modeled the contribution of wood from forest plantations (up to 120 years old in a Douglas-fir – western hemlock forest), beyond no-harvest buffers of varying widths. The results suggest that no-harvest buffers greater than 10 meters (33 feet) from the stream channel contributed minimal amounts of wood volume to streams. In McDade et al. (1990), the mean wood source distance for first, second, and third order Cascade and Coast Range streams in mature and old growth stands was approximately 10 meters. Conifer tree heights in these stands ranged from 40 to 80 meters (131 to 262 feet). Johnson et al. (2011) demonstrates that in streams adjacent to undisturbed mature or old-growth forests in central and southern British Columbia, 90 percent of the wood at 90 percent of the study sites originated within 18 m (59 feet) of the channel. Robison and Beschta (1990) determined that the probability of a tree falling into a stream channel is primarily a function of tree height and distance from the stream. The upper crown of a tree, however, particularly in managed stands, is not of sufficient size to be considered of functioning size in the channel (i.e. large enough to influence stream morphology). Therefore, the “effective tree height” – the height to the minimum diameter and length necessary for the wood to qualify as “of functioning size” – is a more appropriate standard to use for assessing source area distance.

Based on these findings, in young, dense stands within the project area, where bank erosion and tree mortality are the dominant wood recruitment processes and average tree heights range from 57 to 95 feet, a primary wood recruitment zone of 30 feet from each side of the stream channel was defined. It is believed that in stands of this density and size, a 30-foot no-harvest buffer on small, intermittent (Class 4) streams would protect at least 90 percent of trees that could potentially be recruited to the stream channel and would be sufficient to sustain physical complexity and stability. Because all perennial waterbodies (Class 1, 2, and 3) have 60-foot shade protection buffers, the primary wood recruitment zones would also be protected. In stands with average tree heights greater than 95 feet, wood recruitment zones of at least 60 feet were defined. In many cases where vegetation objectives were already being met, no silvicultural treatments were proposed within Riparian Reserves (see Table 11 and Table 12). Figure 23 and Figure 24 show where treatments are proposed within Riparian Reserves in Alternative 2.

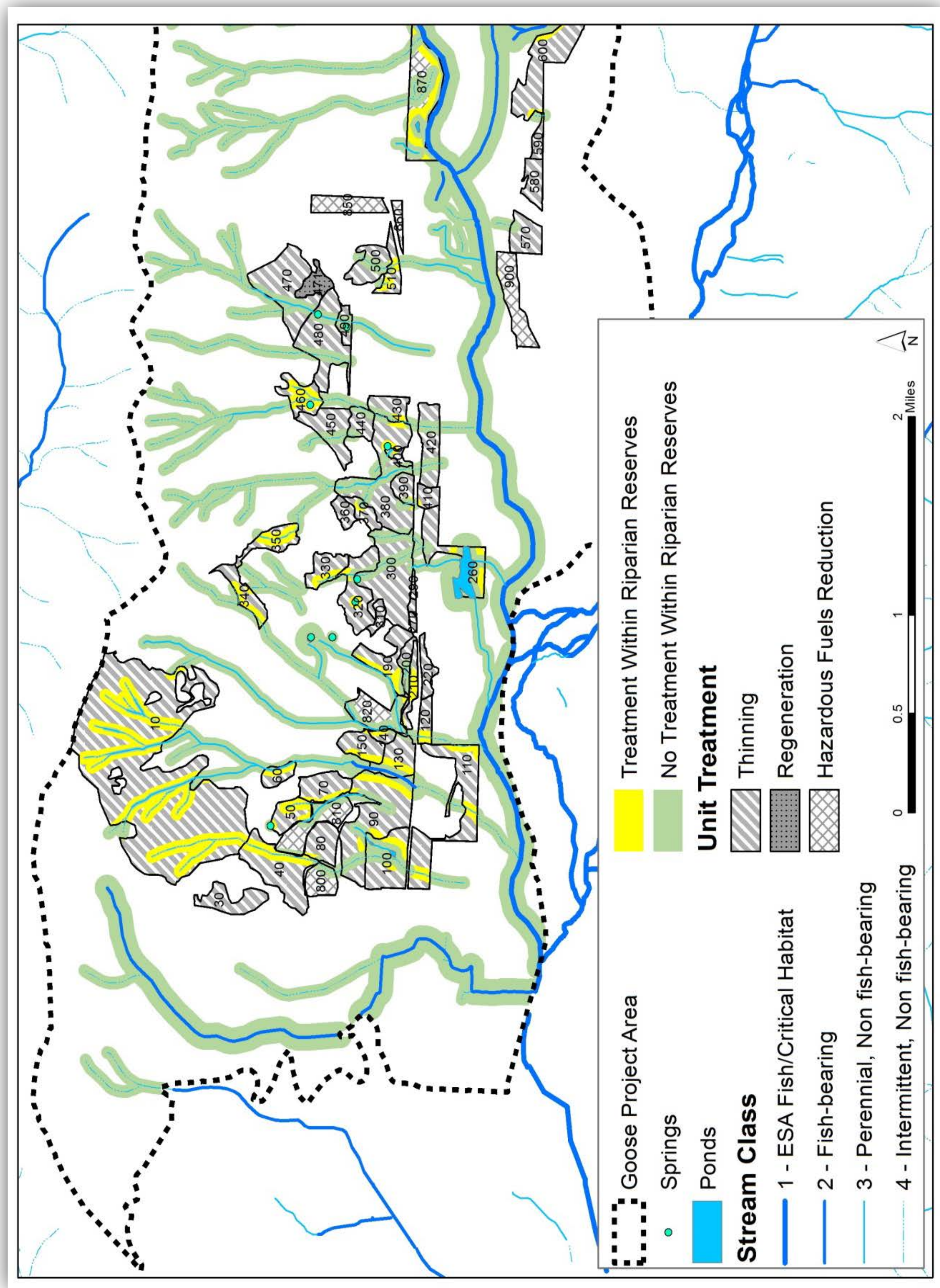

Figure 23. Treatment within Riparian Reserves in Alternative 2 (west)

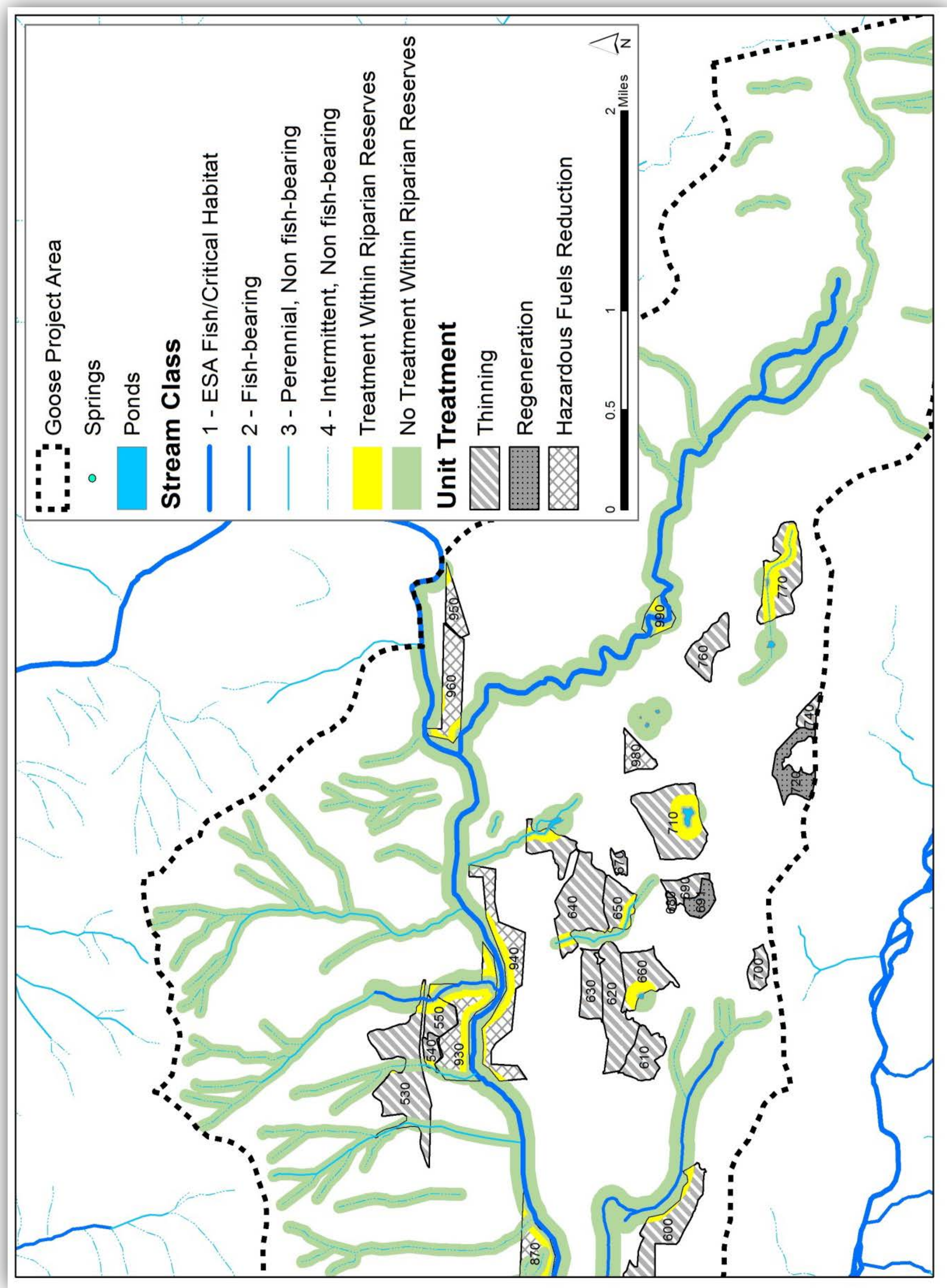

Figure 24. Treatment within Riparian Reserves in Alternative 2 (east)

Numerous studies have been conducted that address both the specific roles of down wood in ecosystem as well as its ecological function for wildlife and aquatic species. However, it is less easy to quantify the exact levels of down wood expected to have occur assuming there were no human impact to the forest since these are subject to many variants. Only two management rotations in Douglas-fir stands have been estimated to reduce the abundance of dead wood by 90% compared to levels in natural old-growth systems (Rose et. al.). It should be noted that stands go through a “U” shaped pattern of down wood development naturally; and depending on stand age, a fluctuation of LWM is expected.

An estimate of the range of natural variability was used to develop down wood objectives. These objectives were based on input from wildlife specialists, modeling exercises using Forest Vegetation Simulator (FVS), and scientific literature review. A summary can be found in Tables 11, 12, 14, and 15. Protecting at least 90 percent of potential wood inputs would maintain ACS Objectives related to in-stream wood while allowing for treatments to improve vegetation and accelerate the growth of future in-stream wood. For the portions of Riparian Reserves where thinning is proposed, the primary and secondary shade zones on all perennial streams (Class 1, 2, and 3) and wetlands as well as the primary wood recruitment zones would be maintained in a state that provides adequate protection. On most intermittent streams (Class 4) and wetlands, the wood recruitment zones would be protected, and where treatment is recommended inside those zones, dead and down wood objectives would be met through special treatments. Across the project area, current levels of down wood are within estimated historical ranges (see Wildlife Section for more information). However within specific treatment units where current estimates are well below historic ranges, down wood creation is proposed so that habitat needs are met at a site specific as well as a landscape level.

Based on a review of existing literature and stand development theory, Spies et al. (2013) found that the “greatest potential ecological benefits of thinning to accelerate the development of older forest structure (e.g. large trees, large dead trees, spatial structure and compositional heterogeneity, etc.) come in dense uniform plantations less than 80 years and especially less than 50 years old.” The benefits of thinning in stands over 80 years old are more variable. Stand conditions were reviewed for each waterbody and recommendations were based on multiple variables, not just age. These factors included tree height and diameter, stand density, species composition, and understory development. In both action alternatives most stands where thinning would occur within Riparian Reserves are under 80 years old. Thinning within Riparian Reserves of stands over 80 would occur in only three units in Alternative 2 (Units 130, 210, 380; all under 100 years old; approximately nine acres total) and only one unit in Alternative 3 (Unit 210; 93 years old; approximately four acres total). These stands have structure and species composition very similar to younger (60-80 year old) plantations. Both units 130 and 380 are fire-regenerated stands but show signs of having been historically salvage logged with other human-caused impacts which likely influenced the current stand condition.

Riparian Reserve treatments in fire regenerated stands would occur only in Alternative 2 in the following units: 10, 120, 130, 260, 300, 320, 330, 340, 350, 380, 510, 530, 540, 550, 590, 600, 640, and 940. Similar to young managed stands in the project area, these fire regenerated stands are in the stem exclusion stage, where small amounts of understory development is apparent and there is very little species diversity. Average trees per acre in these stands is 193, higher than the average 172 trees per acre found in managed stands. The average Stand Density Index is 417, higher than 334 found in managed stands. Because these fire regenerated stands are more heavily stocked than managed stands and the existing lack of complexity and diversity may be limiting nutrient cycling, deciduous organic matter input to waterbodies, and habitat for riparian-dependent wildlife, treatments were proposed. Treatment within Riparian Reserves of the other fire regenerated stands was deemed unnecessary to meet ACS Objectives.

Where thinning is proposed within Riparian Reserves, increases in abundance of understory vegetation, species diversity, stand structural diversity, and tree growth at a faster rate than background levels are expected. It should be noted that some modeling has shown that young conifer stands, if left untreated, would follow a trajectory towards forest structure found in certain reference conditions (Pollock et al. 2012). Reference conditions were considered to have mature, late-successional conifer dominated stands with abundant large trees in the overstory, abundant large snags, and a well-developed understory of shade-tolerant trees. However, according to Harrington et al. (2005) thinning tends to increase shrub cover and greatly increase within-stand variability where shrub cover is absent before treatment. Riparian thinning can also promote the development of late successional forest attributes of value to many riparian and upland-associated species (Pabst et al. 2009, Harrington et al. 2005). Based on new research (Ruzicka et al. 2014), increased tree growth within no-harvest buffers adjacent to thinned stands is also anticipated. In their study, trees responded to an apparent edge effect up to 15 m (49 feet) downslope of thinned areas. Because Alternative 2 has more thinning in Riparian Reserves than Alternative 3, 138 and 57 acres respectively, the benefits in Alternative 2 would be greater. Table 25 shows acres proposed by treatment type for each alternative.

In Alternative 2, portions of Riparian Reserves in Units 70, 320, 330 340 and 350 (all under 80 years old) would be thinned to increase vegetation diversity. In addition to thinning, dead wood creation of at least 2 additional snags per acre and down wood creation of at least 8 trees per acre is proposed in order to increase the immediate dead and down wood component. In Alternative 3, only Unit 70 would have dead and down wood creation.

Natural fuels underburning was considered within Riparian Reserves of proposed Units 800, 810, 820; but these late-seral forests are currently functioning and meeting ACS Objectives. Therefore, no underburning within Riparian Reserves is recommended in these units. Since underburning would occur in the unit outside of Riparian Reserves, fire would be allowed to back into the no-treatment buffers to eliminate the need to dig a fireline and cause soil disturbance. Based on past experience, firefighters have been very successful at extinguishing fire near the no-treatment buffer using water instead.

Hazardous fuels treatment was also considered within Riparian Reserves of proposed units 870, 930, 940, 950, 960, and 990. Conditions within the stream influence zone (0-172 feet) were already meeting ACS Objectives, so no treatment was recommended. In the outer portions of Riparian Reserves (172-344 feet) on Class 1 and 2 streams, non-commercial thinning of trees and shrubs <10" diameter was recommended to reduce hazardous fuels in the Wildland-Urban Interface and risk of high severity fire.

There are approximately 4,280 acres of Riparian Reserves within the project area. Table 25 summarizes the acres of Riparian Reserves affected by the various vegetation treatments. It also includes the number of acres that would not be treated based on recommendations from site specific field visits.

Table 25. Riparian Reserve Management on Federally Managed Lands

Total Acres of Riparian Reserve within the Project Area	Activity	Proposed for Treatment (Acres)		
		Alternative 1 (No Action)	Alternative 2	Alternative 3
4,280	Thinning	0	138	57
	Dead and Down Wood Creation	0	24	3
	Fuels Treatment	0	264	85
	No Treatment (within the units)	429	291	89

Wherever possible, temporary roads would be located on ridge tops or gentle slopes or would utilize previously disturbed locations not decommissioned with historic logging. Those segments located within the Riparian Reserves would be located well outside of the primary shade zone or cross perpendicular to the stream. Approximately 0.85 miles and 0.46 miles of temporary roads are proposed within the Riparian Reserves for Alternatives 2 and 3 respectively. This is approximately 2 – 4 acres of ground disturbance. There are five proposed temporary road crossings which are needed to access portions of units. Impacts to large wood are expected to be similar to those of thinning treatments. All temporary road crossings would be removed and all temporary roads in Riparian Reserves would be decommissioned after treatment activities are completed.

In summary, the adverse impacts of thinning on in-stream large wood and future recruitment would be very minor at the watershed, project, and reach scales because only 138 and 57 acres (3 percent and 1 percent of the project area) of Riparian Reserves would be thinned in Alternatives 2 and 3, respectively, and within those units at least 90 percent of the wood recruitment zones would be protected. The minor reduction in wood recruitment would occur at a very slow rate due to the naturally slow rate of the dominant wood recruitment processes (bank erosion and tree mortality) of streams in the project area. The beneficial impacts of thinning to accelerate tree growth would also be very minor at all scales due to the relatively small area treated and slow rates of tree growth and wood recruitment. The beneficial impacts of thinning on riparian forest structure and diversity would be minor at the watershed scale due to the limited area of treatment (<1 percent), but would have measureable beneficial impacts at the project and unit scales. Benefits of thinning are well documented, would start occurring within 3-5 years, and would persist for decades. The proposed management of Riparian Reserves in Alternative 2 and 3 would not deter attainment of and would largely benefit ACS Objectives. The Aquatic Conservation Strategy compliance document (Appendix E) explains how each Objective is maintained or improved.

Cumulative Effects

Alternatives 2 and 3

All recent and planned timber harvest and hazardous fuels reduction projects were and will be designed with similar protection measures, design features, and Best Management Practices that minimize effects to water quality and aquatic resources. Each of the past projects listed in the Past, Present, and Reasonably Foreseeable Actions Relevant to the Cumulative Effects Analysis (Appendix D) were analyzed for effects to riparian condition and were found to have no effect, negligible effect, or beneficial effect. The negligible or beneficial effects combined with the minor impacts expected from the Goose project would not measurably contribute to impaired riparian conditions.

Eugene Water and Electric Board’s transmission line corridor runs through the project area and crosses approximately 17 streams in the project area. This corridor is maintained in an early-seral condition, reducing shade and potential wood recruitment. The total area of adverse effect within Riparian Reserves of the project area is approximately 10 acres (0.2 percent). This minor amount of affected area combined with the minor impacts expected from the Goose project would not measurably contribute to impaired riparian conditions.

Private timber lands are present in the project area. Although they are managed according to Oregon Forest Practice Rules, impacts to streams may occur. Because the primary shade and wood recruitment zones would be protected and impacts minimized on federal lands, cumulative effects to streams across the watershed are not anticipated.

3.4.6 Affected Environment – Stream Shade and Temperature

Major road construction and timber harvest began in the project area in the 1940s, peaking in the 1970s and 80s. Much of the activities that occurred prior to implementation of the Northwest Forest Plan resulted in removal of riparian vegetation that provided shade for streams.

Stream temperature data were collected at three locations in the project area during the summer months (June through September) for a minimum of 3 years beginning in 2008 and were compared to control streams. The control stream temperature data were collected for a minimum of two seasons with a maximum of nine seasons. Control streams were selected because they are relatively un-impacted and were thought to be hydrologically and geologically similar to streams in the project area. A summary of the data is provided in Table 26.

Table 26. Stream Temperatures in the Goose Project Area

Control Streams	Lowest 7-Day Average Daily MaxTemp. °C*	Highest 7-Day Average Daily Max Temp. °C*	Range of Values °C	Composite Average Value °C
Walker Creek	14.4	16.3	1.9	14.8
Cone Creek	16.6	19.5	2.9	17.3
Non-Control Streams				
McKenzie River (below Trailbridge)	8.9	10.2	1.3	9.7
Florence	12.6	13.8	1.2	13.0
Glenn	18.7	21.5	2.8	19.7
Powers	13.4	13.7	0.3	13.6

* Maximum 7-day average

Existing condition for temperature in the project area varies widely – both between the control streams and between control and non-control streams. Much of this variability is due to the geomorphology of the stream channels. Florence Creek and Powers Creek are lower than control streams by about 1.2-3.7 º C. There are numerous factors that influence this temperature variability between streams. One of the main factors is attributable to the deeper glacial soils improving hyporheic exchange (cooling influence of groundwater) within the Florence and Powers Creek drainages. In contrast, Glenn Creek is on average 3º C warmer than the baseline control conditions. Due to the intermittent flow pattern of the stream (varying between Class 4 and Class 3 conditions), sensor deployment sites were limited and often more exposed to overhead sunlight during parts of the day.

Changes in the range of maximum temperatures from one water year to the next are attributable to inter-annual differences in precipitation and stream flows. The annual timing of the maximum temperature occurred between July and August in all instances. This suggests that any past management impacted only the increased value for maximum temperature and has not affected inter-annual variability or annual timing of peak temperatures.

Under section 303(d) of the 1972 Clean Water Act, states are required to develop lists of impaired waters. Oregon’s 2010 303(d) list was finalized in December 2012 and is the currently effective 303(d) list. Oregon's 2012 Integrated Report and 303(d) list is waiting for EPA review. According to the 2010 report the upper portions of the McKenzie River are listed as Category 4A: Water quality limited but the TMDLs have been approved and it has been delisted (Oregon DEQ. 2010. 303(d) List of Impaired Waters). Mill Creek which is just west of the project area is also listed as Category 4A for rearing (17.8° C). White Branch is listed as Attaining which means all the water quality criteria are being met.

3.4.5 Environmental Consequences – Stream Shade and Temperature

Direct and Indirect Effects

Alternative 1 – No Action

With the implementation of this Alternative, removal of shade in the Riparian Reserves would not occur. Water temperatures in streams in the project area would continue to recover toward more natural levels with the reestablishment of riparian vegetation that was disturbed or removed by management activities prior to implementation of the Northwest Forest Plan. However, with the increased risk of high severity wildfire, which can be carried more easily through dense stands, stand replacing fire could potentially affect water quality in the future. The corresponding loss of vegetation and duff could affect temperatures and microclimates around the edges of perennial streams and wetlands. Intermittent (class 4) streams and seasonal wet meadows go dry during the summer when temperatures are typically an issue, so increased stream temperature at the current vegetation conditions or after a high-severity fire is not expected in most of the class 4 streams in the project area. However, temperatures in perennial streams would be affected as would microclimates. See the Fire and Fuels Section in Chapter 3 for more specifics on the probability and effects of wildfires in the project area.

Alternatives 2 and 3

The system of Riparian Reserves under the ACS provides zones around streams, wetlands, and water bodies that contribute to protecting or restoring the physical, chemical, and biological integrity of these waters, which is the major goal of the Clean Water Act. For all action alternatives, treatments within riparian areas have been designed to comply with the “Northwest Forest Plan Temperature TMDL Implementation Strategies – Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards” (USDA 2012). All streams exhibit intra-annual variability greater than 0.3° C despite the fact that there has been no additional vegetation management along these streams during the time they were monitored.

To comply with the stream temperature standards, no-treatment buffers were developed to eliminate management effects. These buffers were developed based in part by calculating the width of the riparian area adjacent to perennial stream channels that provides stream shade for the period of greatest solar loading, known as the primary shade zone, and the width of the riparian area that provides shade in the morning and afternoon, considered the secondary shade zone. Research has shown that in many cases significant changes in stream temperature are not observed with partial no-harvest buffers within the Riparian Reserve width (Levno and Rothacher 1967, Brown and Krygier 1970, Swift and Messer 1971, Macdonald et al. 2003). In many cases, buffer distances less than one site potential tree height have been shown to protect water temperature. Typically the primary shade zone is half of the site potential tree height. Gomi et al. (2006) reported maximum daily temperatures in headwater streams did not increase significantly when 30- and 90-foot buffers were applied.

In overly dense riparian stands, optimum shade can be provided by the primary shade zone alone, and the secondary shade zone may contribute little to no shade since trees in the primary shade zone are already blocking the sun’s solar radiation. In all of the units with proposed thinning in Riparian Reserves, conifer densities are high and would benefit from thinning. Some of the streams in the project area are less than 3 feet wide and others have very coarse substrate. The effective shade needed is typically less for these types of streams. Several papers have been published recently indicating that hyporheic flow, not just shade, has a significant influence on stream temperature. Janishch et al. (2012) found that the canopy cover of “buffers” was not a strong variable for temperature in small (< 7feet wide) headwater streams. Instead, the streams with course-textured streambeds tended to be thermally unresponsive as compared with fine-textured streambeds or those with small, near-stream wetland areas. This re-emphasizes the important role gravel and large wood plays in stream temperatures and was used to further establish no-treatment buffer recommendations.

The development of no-harvest buffer widths also took into account the stream classification. Intermittent (Class 4) streams are dry during the portion of the year when elevated temperatures occur and therefore temperature is not as significant an issue. However, no-harvest buffers of 30 feet which were designed for other resource objectives would provide substantial shade when water is present regardless. Much of the microclimate would also be preserved since the gradients are strongest within the first 20-30 feet (Anderson 2007) and a portion of the canopy closure throughout the rest of the Riparian Reserve would be maintained. No-treatment buffers on perennial streams have varying widths developed, in part, to accelerate species and structural diversity while protecting effective shade. Class 3 (non-fish bearing perennial) streams within the proposed harvest units have a minimum 60-foot no-harvest buffer to retain effective stream shade and terrestrial microclimates (Anderson 2007) while still providing the opportunity to thin the rest of the Riparian Reserve for other desired characteristics. Fish bearing perennial streams (Class 2) are provided with a minimum of a 90-foot no-harvest buffer to retain effective stream shade. Where there is risk of high thermal loading, soil stability, and desired stand characteristics present, no-treatment buffers are wider.

There are five proposed temporary stream crossings as part of Alternative 2 – four Class 4 streams (Units 110, 420, 510, 590) and one Class 3 (Unit 480). In Alternative 3 there is only one temporary stream crossing over a Class 4 stream (Unit 110). Class 4 streams are dry during the summer when water temperature is typically a concern. At the Class 3 stream, the width of the clearing needed to establish the crossings would not create a detrimental change in temperature or shade because the primary and secondary shade zones of the adjacent riparian area would retain sufficient canopy closure to provide shade to this narrow stream. A few short segments of other temporary roads would enter the outer portion of Riparian Reserves but not cross any streams and would remain outside the primary shade zone. Historic skid roads would be used where possible. All temporary roads would be decommissioned after completion of treatment activities. Decommissioning would include the removal of any stream crossings, subsoiling compacted surfaces, waterbarring as needed, and revegetating with native species. This would allow for historically compacted areas to be re-used then properly sub-soiled and re-vegetated in order to reduce overall compaction levels. The reduction in canopy closure of the secondary shade zone is taken into account in the overall calculations of canopy closure on Riparian Reserve thinning treatments. Based on implementation of the design features outlined in Chapter 2, Table 13 as well as field observations during project reconnaissance; a minimal direct effect is anticipated at a localized level within a few feet downstream of the temporary road crossings.

No long-term (> 5-10 years) increases of stream temperature are anticipated within the project area as a result of these alternatives. Additionally, thinning of dense stands and managing fuel loading helps reduce the risk of high severity wildfire. This in turn reduces the risk of impacts to stream shade and microclimate. Where Riparian Reserves are actively managed, a minimum of 50 percent canopy closure (approximately 40 percent canopy cover) is preserved in the outer portions (outside the no-harvest buffer) to help protect microclimate also.

Due to protection of primary and secondary shade zones, stream temperatures within the project area would continue to recover toward more natural levels as riparian vegetation re-grows and stream bed complexity increases with the natural addition of large wood. Thinning within the secondary shade zone of over-stocked plantations with small diameter riparian trees would increase growth of the remaining trees. Over time, stream temperatures would be maintained and shade would increase due to both natural vegetative recovery in the primary shade zones and treatment induced tree growth in the secondary shade zones.

Cumulative Effects

Alternatives 2 and 3

All recent and planned timber harvest and hazardous fuels reduction projects were and will be designed with similar protection measures, design features, and Best Management Practices that minimize effects to stream temperature. Each of the past projects listed in Appendix D were analyzed for effects to riparian condition and were found to have no effect. Ongoing timber harvest on private lands follow the Oregon Forest Practice Rules; and since most of the streams flowing out of private lands are intermittent or ephemeral streams, temperature degradation is not expected within the watershed.

Eugene Water and Electric Board's transmission line corridor runs through the project area and crosses approximately 17 streams in the project area. This corridor is maintained in an early-seral condition thus reducing shade and has the potential to increase localized stream temperatures on the perennial streams. The total area of adverse effect within Riparian Reserves of the project area is approximately 10 acres (0.2 percent). This minor amount of affected area combined with the minor impacts expected from the Goose project would not measurably contribute to impaired stream temperatures to any measurable degree.

3.4.7 Affected Environment – Stream Flow/Disturbance History

Projects involving timber harvest on the Willamette National Forest are analyzed for their cumulative impact on the quantity and timing of peak flows and water yields using an accounting methodology known as Aggregate Recovery Percentage (ARP), as specified by the Forest Plan. The ARP model compares the acres of an analysis area within the transient snow zone that is recovered against a threshold value (Midpoint) that was calibrated for the area during development of the Forest Plan. The midpoint values were developed based on the soil, geology, vegetation, climate, and stream channel conditions of each sub-watershed and are intended to represent a minimum safe level of vegetative recovery in the sub-watersheds to prevent significant alteration of peak flow regimes as a result of management activities. Recovery generally occurs when stand diameters average 8" dbh and crown closures exceed 70 percent. The analysis is based on data extracted from the Forest's VEGIS database, which includes information about all past harvest activities in the sub-watershed. Currently, ARP levels in the Florence Creek-McKenzie River and Lost Creek Sub-watersheds stand at about 92.5 percent as of 2014, and are far above the Forest Plan Midpoints of 75 percent and 70 percent respectively. No vegetation management is proposed in the Elk Creek-McKenzie River Sub-watershed, so effects to ARP levels were not calculated.

3.4.8 Environmental Consequences – Stream Flow/Disturbance History

Direct and Indirect Effects

Alternative 1 – No Action

Current ARP values are well above Midpoint. Alternative 1, No-Action, would result in no changes to existing peak flows based on vegetation removal. However, several miles of roads are in poor condition and funnel water to stream crossings or into alternate drainages. These alterations to stream flows would not be improved with the implementation of this Alternative due to the lack of road maintenance and storage. However, the effects would be localized to a few yards downstream.

Alternatives 2 and 3

Table 27 summarizes levels of recovery immediately after implementation of the project for each of the alternatives. Completion of implementation is estimated to occur by 2020.

Table 27. Estimated Recovery Levels in the Florence Creek- McKenzie River and Lost Creek Sub-watersheds Post-implementation (2020)

Sub-watershed	Alternative 1 (No Action)	Alternative 2	Alternative 3	Midpoint ARP
Florence Creek-McKenzie River	94.7	90.6	92.5	75
Lost Creek	95.7	93.5	93.7	70

ARP levels are maintained above recommended midpoint values for all alternatives in the affected sub-watersheds even immediately after implementation when the potential for adverse impacts to vegetation would be greatest. Therefore, no altered peak stream flows are anticipated from implementation of the proposed actions.

Additionally, several miles of roads are currently in poor condition and funnel water to stream crossings or into alternate drainages. These alterations to stream flows would be improved and upgraded with the implementation of this Alternative. However, the effects would be localized to a few yards downstream.

Overall, there would be no adverse impact to stream flow timing or duration through the implementation of these alternatives.

Cumulative Effects

Alternatives 2 and 3

ARP levels would remain well above the midpoint values and there are no reasonably foreseeable future actions within the project area that would result in effects that differ from those already disclosed for each of the alternatives.

3.4.9 Affected Environment – Sedimentation

The majority of the geologic terrain and soils within the project area are not inherently prone to extensive erosion unless disturbed as discussed in the Soils Specialist Report (located in the project file). However, this area has many streams dissecting the project area which resulted in numerous stream crossings during construction of the original road system.

Since implementation of the Forest Plan in 1990, road maintenance activities have worked to eliminate many unstable fill situations. Even so, roads continue to be the largest source of human-caused sedimentation in the project area, and a few old roads still carry water during winter storm events essentially extending the stream system and occasionally diverting flow from natural stream channels. Additional impacts to streams within the project areas include failing culverts and displacement from steep road walls. Other stream reaches have been completely covered by historic logging debris. Road densities over 3.5 miles of road per square mile are considered “Not Properly Functioning” (FEMAT 1993). Road densities are about 3.1 and 3.5 miles per square mile in Florence Creek-McKenzie River and Lost Creek 6th field Sub-watersheds, respectively.

In addition, past timber harvest methods resulted in compaction levels varying from 5 percent to 15 percent for most of the units harvested with ground based logging systems. However, two units were approaching the 20 percent maximum allowed by the Forest Standards and Guidelines (Soils Specialist Report). With increasing levels of compaction, there is an increased risk of surface erosion.

Based on observations of existing road conditions during field reconnaissance for the project, sediment outputs from roads were estimated using the roads module of the Watershed Erosion Prediction Project (WEPP) model. The current sediment yield from roads is estimated at 127 cubic yards per year for the project area. Actual yields cannot be accurately calculated since there are numerous annual and inter-annual variations that would need to be considered including weather conditions, timing of peak flow events, etc. Research comparing WEPP estimated sediment rates to actual rates has shown the model to over-estimate values. Therefore sediment predictions using WEPP modeling should only be used for relative comparisons between alternatives rather than actual values expected to be produced.

3.4.10 Environmental Consequences – Sedimentation

Direct and Indirect Effects

Alternative 1 – No Action

Rates of road related sediment yield were estimated to gradually increase, but eventually stabilize under Alternative 1 (No Action), reflecting no specific changes due to the lack of road upgrades. Alternative 1 would not correct existing road erosion problems which result in chronic sedimentation to streams. Without timber harvest related road maintenance, the existing budgetary trend would result in only the main roads being maintained. Culverts that are not maintained could plug and cause washouts. The resulting sediment plumes could be detrimental to fish and amphibians. Over several decades, these road issues would stabilize as the disturbed areas re-vegetate. However, no project-related storage would occur. Harvest activity on the portion of private land within the project area would continue as would use of shared roads. Table 28 provides a comparison of sediment outputs between all alternatives.

Alternatives 2 and 3

Past human activities have resulted in altered sediment regimes along many of the streams. Hydrologically disconnecting roads by installing or improving road drainage features is a fundamental practice for eliminating chronic water quality impacts from roads and other disturbances. At a minimum, these activities would include maintenance of proper drainage through maintaining existing structures, installing water bars, or restoring natural drainage features. Installation of new ditch-relief culverts and replacement of existing ditch-relief culverts that are currently in poor condition would also be included. These actions would reduce the likelihood of sediment leaving the road through runoff by reducing the average distance between drainage structures and consequently, the amount of water that each structure needs to handle. Less water on the road translates to less sediment-carrying capacity.

Road work associated with the Goose project would also include replacement of a number of culverts that are currently in poor repair or inadequately sized to pass 100-year flood flows (Q100). These culverts currently pose an elevated risk of fill failure. Discussion with engineering personnel indicated that the average fill volume is around 250 cubic yards. This material is at risk of entering the streams and potentially generating debris torrents if the existing culverts fail.

However, replacement would require in-stream work in these locations. Work would be done during non-flow periods for intermittent streams, and engineering practices such as sediment barriers and flow bypass would minimize impacts on perennial streams. Flows in perennial streams are all expected to be less than 1.0 cubic feet per second when work occurs, based on personal observation during project reconnaissance. It is not possible to do this work without some sediment delivery, and accurate estimates are not predictable. Depending on weather behavior and other variable factors, sediment yields should fall between 0.5 and 1.5 cubic yards per installation based on professional experience. This sediment would settle out within a few feet and is not in amounts that would harm aquatic insects or amphibians.

An analysis of estimated sediment outputs from roads in the project area was completed using the roads module of the Watershed Erosion Prediction Project (WEPP) model. The same analysis was conducted for each alternative incorporating all project related road maintenance, temporary road construction activities, haul route activity, and temporary road decommissioning. Results were calculated to estimate sediment production rates during the implementation of the project as well as conditions following completion of the project. Table 28 shows the estimates of sediment production rates based on WEPP.

For both of the action alternatives, annual sediment yield increases during harvest activities. This represents an incremental 27.5 - 28.4 percent increased contribution of sediment that cumulatively adds to the sediment already produced under the existing road system. Alternative 2 shows the highest increase during operations when there is increased traffic on haul routes and freshly established temporary roads. Both action Alternatives show a decrease in sediment yield post-operation due in part to maintenance, temporary road decommissioning, and storage.

Table 28. Estimates of Sediment Production Rates for the Goose Project Area

Sediment Production	Alternative 1	Alternative 2 during harvest	Alternative 2 after harvest	Alternative 3 during harvest	Alternative 3 after harvest
Gross Road Sediment Yield (yd^3/year)	102	131	101	130	102
Net increase/decrease	---	29	-1	28	-0.5
% increase/decrease	---	28.4	-0.6	27.5	-0.5

Approximately 6.9 miles of temporary road construction would occur with Alternative 2 and 2.2 miles with Alternative 3. This represents approximately 30 acres and 9 acres of ground disturbance respectively. All temporary roads would be stabilized with erosion control measures as necessary for the wet season to minimize accumulation of runoff and transport of sediment, and they would be fully decommissioned after the project is complete. Decommissioning would include the removal of all stream crossings, subsoiling the compacted surface, and revegetating with native species.

Table 29 provides a summary of the culvert replacements and the potential amount of stabilized fill material that would have a reduced risk of entering streams. It also estimates the amount of sediment produced from the culvert replacements. Based on professional experience, each fill removed would produce on average <1 cubic yard of fine sediment that would leave the fill removal site and settle out in the first 100 feet below the fill removal during the first winter. The maximum estimate of sediment yields from the culvert replacements would be approximately 12 cubic yards for Alternative 2 and 3. In comparison, the estimated volume of fill stabilized is 2000 cubic yards for Alternative 2. Either Alternative 2 or 3 would reduce the potential for runoff effects and culvert failures that may affect Riparian Reserves or water quality.

Table 29. Approximate Culvert Replacements in Perennial and Intermittent Streams by Alternative

Alternative	Stream Type	Number of Culverts Installed/Replaced/Removed	Cubic Yards of Fill Stabilized	Sediment Yields from Culvert Replacements (Cubic Yards)
Alternative 1	None	0	0	0
Alternative 2 and 3	Perennial	1	250	0.5-1.5
	Intermittent	7	1,750	3.5-10.5

Alternative	Stream Type	Number of Culverts Installed/Replaced/Removed	Cubic Yards of Fill Stabilized	Sediment Yields from Culvert Replacements (Cubic Yards)
	Total	8	2,000	4.0-12.0

Most harvest-related sediment input to streams comes from skid trails, historic roads that were poorly located, or historic skyline corridor crossings. Research has shown that by keeping these at least 33 feet from streams and following Best Management Practices (BMP) guidelines, essentially all of the harvest related sediment is eliminated (Rashin et al. 2006, Lakel et al. 2010). In addition, as discussed in the Soils section of this document, soils in the project area have naturally high rates of infiltration and low potential for overland flow. The design features for Alternative 2 and 3 designate additional equipment exclusion zones wider than the no-harvest buffers which would essentially eliminate any routing of water from the logging operations

The McKenzie River Sub-basin, including the project area, provides municipal water to the City of Eugene by way of the Eugene Water and Electric Board's intake at Hayden Bridge, approximately 60 miles downstream from the project area. Sedimentation and associated turbidity are the most likely consequences of the Goose project that could adversely affect municipal water quality, but with the design features as well as Best Management Practices, adverse effects are not anticipated.

By implementing the activities associated with the Goose project, overall human caused sediment input would decrease only slightly (< 0.6 percent) from current levels. Annual pulses of sediment would continue. In some years the sediment input would be greater than in other years, but overall the sediment input levels are expected to remain near current levels until a large flood event occurs. Risk of road and fill failures during major storm events would be reduced as well. Overall, implementation of these alternatives would reduce management-caused sedimentation within the project area.

Cumulative Effects

Alternatives 2 and 3

All recent and planned timber harvest projects were and would be designed with similar protection measures, design features, and Best Management Practices that minimize effects to stream.

Ongoing timber haul on private lands as well as annual road maintenance would continue into the foreseeable future throughout the watershed. However, private lands are under the jurisdiction of the Oregon Forest Practice Rules which requires a different set of standards and BMPs to reduce sedimentation into the waterways.

Eugene Water and Electric Board's transmission line corridor runs through the project area and crosses approximately 17 streams in the project area. This corridor is maintained in an early-seral condition. The total area affected within Riparian Reserves of the project area is approximately 10 acres (0.2 percent of the project area). Where the transmission line crosses the streams, most of the side slopes are well vegetated which reduces the risk of sedimentation. Overall, the lines only add minor adverse impacts, and the Goose project would not cumulatively contribute to impaired conditions.

3.4.11 Affected Environment – Fisheries, Aquatic Insects, and In-stream Habitat

Management Indicator Species

The Willamette Forest Plan recognizes anadromous and resident salmonids as economically important species and designates them as management indicator species for riparian habitat and water quality. Salmonids are good indicators because they are predators in the stream ecosystem. This means that they are not only affected by the physical conditions of their habitat but also by the metabolic energy pathways in the watershed from primary production to decomposition. The most common salmonid sport fishes on the McKenzie River Ranger District are spring Chinook salmon, bull trout, rainbow trout, and coastal cutthroat trout.

Native rainbow trout are river dwelling in the main stem McKenzie River and larger tributaries including Lost Creek. Lost Creek is a major upper McKenzie Sub-basin tributary, providing significant habitat for all life stages of resident rainbow trout. It also serves as spawning and rearing habitat for fluvial rainbow trout that spend most of their adult life in the McKenzie River. The robustness of rainbow trout populations is believed to be diminished. The combination of habitat condition, and ODFW stocking of non-native rainbow trout and introduced summer steelhead, is believed to suppress native rainbow trout abundance in the project area through competition with non-native species.

Native coastal cutthroat trout are the most widely distributed fish in the McKenzie River Sub-basin, ranging from headwater streams to the mainstem McKenzie River (Class 1 and 2 perennial and intermittent fish-bearing streams). Previous timber management in riparian areas has affected aquatic habitat quality by altering the quantity, size and recruitment source of large woody material, which can affect substrate storage, habitat composition (e.g. pools, riffles, off channel habitat) and water temperature.

ESA Listed Species

Native spring Chinook salmon migration, spawning and rearing occur in the mainstem McKenzie River and Lost Creek in the project area. This distribution overlaps current and historic bull trout distribution in the project area, used mostly for foraging and as a migration corridor to upstream spawning areas. Both of these species are listed as Threatened under the Endangered Species Act.

Low gradient reaches of the McKenzie River and Lost Creek in the project area are used as spawning habitat by spring Chinook salmon. Spawning in these reaches occurs in September and October, with fry emergence about 3 months later.

The McKenzie River Sub-basin provides habitat for the largest remaining population of wild spring Chinook salmon in the Willamette Basin. High water quality in the form of cold water temperature and high habitat quality remaining in the upper sub-basin provides the largest remaining core area for spring Chinook salmon reproduction and rearing in the basin. The project area portion of the sub-basin historically provided greater quantity and quality habitat with a greater level of channel complexity and off-channel area. River adjacent development (rural residential development and bank hardening), reduced large wood recruitment potential, and modified flow, sediment and wood routing regimes (as modified by dams and roads), have diminished salmon production in the project area.

Bull trout use the McKenzie River and Lost Creek within the project area as a migratory corridor and as sub-adult and adult foraging habitat. River temperatures are naturally too warm in these reaches to provide bull trout spawning and early rearing habitat. Bull trout migration through the project area, en route to spawning habitat, occurs upstream beginning in late spring and downstream following completion of spawning in fall. Historic channel complexity is expected to have provided greater quantity and quality for prey species, particularly spring Chinook salmon, and for greater numbers of foraging bull trout. For more details see Fisheries Biological Assessment located in the project file.

More detailed information on ESA-listed fish use of the watershed and project area is described in the Fisheries Biological Assessment, located in the project file.

Aquatic Insects

Three aquatic insects found on the Regional Forester's sensitive species list have been documented on the Willamette National Forest. These aquatic insects are all caddisflies and little is known about them. A short summary of the distribution and known habitat associations are provided below.

Rhyacophila chandleri: In Oregon, this species is documented on Willamette, Deschutes, and Umpqua National Forests. It is documented on the Willamette National Forest as a rare insect on the H.J. Andrews Experimental Forest. The entire *Rhyacophila* genus, whose name is derived from the Greek roots *rhyaco* (stream or torrent) and *philia* (fondness), is confined to running water. In the Cascade Mountains of Oregon, this species is associated with very cold, larger spring-fed streams (USDA Forest Service and USDI Bureau of Land Management 2012). Elevations of known populations range from around 1219 to 1700 m (4000 to 5600 ft.) in Oregon. The larval behavior and diet of *R. chandleri is* not known, but probably similar to others in the *Rhyacophila verrula*-group. While most *Rhyacophila* larvae are obligate predators, feeding on aquatic invertebrates, members of the *verrula*-group are unique in having phytophagous diets (i.e. feeding on plant material) consisting largely of filamentous algae, diatoms, detritus, bryophytes, liverworts, and/or other non-animal material (USDA Forest Service and USDI Bureau of Land Management 2011 and 2012).

Rhyacophila leechi: In Oregon, *R. leechi* is documented to occur on the Willamette National Forest and on Bureau of Land Management land in the Medford District. Adults have been collected from springs and cold, spring-fed streams. This species appears to require colder water temperatures than the common and more widely distributed *Rhyacophila. verrula*, and is likely confined to smaller, headwater streams and springs (USDA Forest Service and USDI Bureau of Land Management 2011). Oregon sites range in elevation from 440 to 980 m (1444 to 3210 ft.). The larval behavior and diet of *R. leechi is* not known, but probably similar to others in the *Rhyacophila verrula*-group. While most *Rhyacophila* larvae are obligate predators, feeding on aquatic invertebrates, members of the *verrula*-group are unique in having phytophagous diets (i.e. feeding on plant material) consisting largely of filamentous algae, diatoms, detritus, bryophytes, liverworts, and/or other non-animal material (USDA Forest Service and USDI Bureau of Land Management 2011 and 2012).

Namamyia plutonis: This species of caddisfly occur in the Coast and Cascade Ranges of Oregon and California (USDA Forest Service and USDI Bureau of Land Management 2010). Populations tend to be extremely localized and are patchily distributed. Currently, fewer than 30 locations are known to contain this caddisfly, which occurs in low numbers. *Namamyia plutonis* can be found associated with small streams in densely forested old growth or mature forests, but the majority of the documented occurrences are between 30 and 50 years old. Most species of trichopterans have very specific preferences regarding water temperature, flow, oxygen levels and substrate characteristics.

Sampling for these species has not been done in the project area, so it is unknown if they occur there. The McKenzie River and Lost Creek are the type of habitat that *R. chandleri* requires for survival (i.e. large spring-fed rivers), so that habitat is treated as potentially occupied. *Rhyacophila leechi* may prefer small, headwater streams and springs and could be found in the project area. *Namamyia plutonis* tend to be found associated with small streams in mid-seral and old growth forests and could also be found in the project area.

In-stream Habitat

The condition of many in-stream habitat elements contributes to overall aquatic habitat quality. These elements include, but are not limited to:

Stream Temperature	*Large Woody Material*
Dissolved Oxygen/Turbidity	*Pool Frequency and Quality*
Chemicals/Nutrients	*Off-Channel Habitat*
Riparian Structural and Species Diversity	*Refugia*
Physical Barriers	*Streambank Condition*
Substrate Composition	*Floodplain Connectivity*

Stream temperature for most streams in the watershed is functioning properly and shade continues to recover from historic timber harvest. Dissolved oxygen is high, turbidity and fine sediment delivery is relatively low, and there is no indication of chemical contamination. The overall lack of deciduous and herbaceous vegetation (discussed in detail in Section 3.4.2) may be impacting stream ecosystems. Due to the relatively low carbon:nitrogen ratio, deciduous litterfall is much more readily usable and nutritious to the aquatic foodweb than is conifer litterfall. The current imbalance may be limiting stream productivity.

Three dams in the watershed act as physical barriers to fish migration and delivery of wood and sediment to downstream reaches. This has a major impact on substrate composition and habitat quality for aquatic communities. In-stream large wood frequency in the McKenzie River and many tributaries is considered to be below historic levels and not properly functioning – mostly due to the decrease in size of recruited wood, the inability for wood to move downstream of dams, and the fact that wood frequently gets cut out of the mainstem McKenzie River for safe boating. The lack of large wood impacts pool frequency and quality, off-channel habitat, refugia, and floodplain connectivity which are all not functioning properly. Streambank condition is good throughout the watershed due to high vegetative growth. In general, the habitat elements that contribute to quality fish habitat are in a somewhat impaired condition, primarily due to the presence of dams, the increasing development along river corridors and the removal of large woody material. These conditions need to improve in order to maintain and increase native fish populations in the watershed. For a detailed discussion of the project area on each of the elements listed above see the Fisheries Biological Assessment located in the project file.

3.4.12 Environmental Consequences – Fisheries, Aquatic Insects, and In-stream Habitat

Direct and Indirect Effects

The management activities proposed have the potential to affect the habitat elements listed above, particularly stream temperature, water quality and quantity, riparian structural and species diversity, and large woody material which creates pools, off-channel habitat, refugia, and floodplain connectivity. Because salmonids and caddisflies depend on the functioning of these habitat elements, the effects to habitat elements and how they may impact biota are analyzed.

Alternative 1 – No Action

Alternative 1 would result in little or no change to the habitat elements listed above. Stream temperatures would continue to recover toward more natural levels. Landscape delivery of fine sediment, as modified by the road and stream crossing network, would remain as it is and subject only to scheduled maintenance. The No-Action alternative would leave deteriorating roads and culverts untreated, yielding fine sediment similar to current levels. The current levels would remain within the range of conditions necessary to sustain native aquatic biota, but not optimally so. Periodic stream crossing failures may occur at undersized and outdated culverts, potentially delivering large pulses of fine sediment to fish bearing reaches. Culvert failures may induce stresses on resident fish populations, but not at magnitudes that would be expected to extirpate local populations. Depending on proximity to listed fish habitat, particularly spawning habitat, culvert failures could result in take of listed fish. High sediment loads may also impact sensitive caddisfly populations and other native biota.

Current rates of large wood recruitment, provided mostly by stem mortality (from competition, disease, wind and snow downed trees) and bank erosion, would be maintained. Alternative 1 would provide a slightly higher rate of in-stream wood recruitment compared to the action alternatives. Where the action alternatives protect about 90 percent of the wood recruitment zones, the No-Action alternative would protect 100 percent. In some streams, recruitment trees are of sufficient size to meet ACS Objectives (Appendix E), but in other streams with small diameter riparian stands the aquatic benefit is limited, namely through the reduced ability to store sediment and organic matter and contribute to habitat forming processes (e.g. scour). Though small wood has some value, particularly in the smaller headwater reaches, the longevity of recruited small diameter trees is short-lived, as they break down through abrasion and decomposition more rapidly compared to large trees. Small diameter trees are also more likely to be transported out of the system. In-stream wood abundance is low for most streams in the project area and is largely due to the lack of large enough wood to remain stable in channels. Implementing the No-Action alternative would maintain slower tree growth rates than the action alternatives.

The No-Action alternative would not benefit from thinning to enhance vegetation. Desired riparian conditions – high species and structural diversity with large dead and down wood – would slowly develop over time (several decades) and depend solely on natural thinning events (stem exclusion mortality and disturbance). Without management to increase the abundance of deciduous and herbaceous vegetation in dense, conifer-dominant stands, ecosystem productivity would remain at relatively lower levels. Active restoration of riparian stands that currently do not meet ACS Objectives would not occur. In addition, the currently dense riparian stands would be at greater risk to high severity fire, insect infestation, and disease – all carried more efficiently through overstocked stands.

Alternatives 2 and 3

The Riparian Reserve management strategy outlined in Chapters 1 and 2 was specifically designed to accelerate complex forest structure while protecting and enhancing the habitat elements important to aquatic biota. No-harvest and no-treatment buffers on all streams were established to minimize effects to aquatic species and their habitat. Project design features in Chapter 2, Table 2.8 were incorporated into all activities to similarly protect aquatic resources. Due to these project design features, protection measures, and enhancement treatments, Alternatives 2 and 3 would result in short-term “negligible”, “discountable”, or “insignificant” (official terms used in the Fisheries Biological Assessment) negative effects as well as beneficial effects to the habitat elements listed above. For a detailed discussion of how the project actions affect each habitat element, see the Fisheries Biological Assessment located in the project file.

Thinning outside the primary shade zone and limiting thinning in the secondary shade zone of perennial streams would protect stream shade and temperature within the project area. See the Stream Shade and Temperature Section for details.

Based on hydrologic analysis, changes in flow regimes, including peak flows, are not anticipated from proposed activities. Aggregate Recovery Percentage (ARP) levels, which are used to calculate the potential increase of peak flows, are maintained above recommended values for all alternatives in the affected sub-watersheds even immediately after implementation when the potential for adverse impacts to vegetation would be greatest.

Sediment delivery is expected to increase during project implementation while culverts are being installed and replaced and road maintenance is occurring. There could be a short term (immediately after the first rain of the season) turbidity effect but juvenile and adult salmonids appear to be little affected by ephemerally high concentrations of suspended sediments that occur during most storms and episodes of snow melt (Bjornn and Reiser 1991). Once the project is complete, sediment production rates return to slightly less than pre-project conditions. Either Alternative 2 or 3 would reduce the potential for runoff effects and culvert failures that may affect Riparian Reserves or water quality. See the Sedimentation Section for details. Soil disturbance is likely to occur when trees are felled and yarded with ground-based or cable logging systems. Much of this erosion would be localized and is not expected to enter stream channels. Sediment that is transported to stream channels is expected to be minor because the majority of sediment would be trapped within the no-harvest buffers before it reaches the streams. The project was designed to minimize the amount of sediment that may enter a stream channel and be transported to fish habitat. Distance of timber harvest activity to fish habitat, the presence of a glacial terrace to facilitate sediment deposition, and in most cases, absence of surface connection between harvest activity and fish habitat further reduces risk of fine sediment transport. There may be adverse effects to suspended sediment and substrate at the site-scale, but the probability of sediment reaching and affecting fish habitat is discountable.

Thinning outside of the primary wood recruitment zone was designed to retain the majority of potential wood (>90 percent) while achieving desired vegetation characteristics that support productive aquatic communities. The action alternatives may have a slightly lower rate of in-stream wood recruitment than the No-Action alternative, but the benefits to vegetation diversity and accelerated tree growth would be greater. Debris torrents and material migrating to ESA-listed fish habitat are not a prevalent habitat forming process in the project area due to the wide, flat glacial terrace found along the McKenzie River and Lost Creek that acts as a depositional area before reaching the channel. Instead, the major wood recruitment process on the McKenzie River and Lost Creek is stream adjacent recruitment. There are no commercial thinning activities in the action alternatives adjacent to ESA-listed fish habitat and only six units adjacent to other fish-bearing streams with Management Indicator Species (MIS). The probability that thinning in Riparian Reserves would adversely affect water quality, habitat complexity, sediment storage capacity or floodplain processes in fish–bearing streams is very low. These potential effects on ESA-listed fish, MIS, and sensitive caddisflies are not expected to be measureable for the following reasons:

- About half of the streams draining out of harvest units do not have surface connection to ESA-listed fish habitat. This is due to the porous and permeable nature of the glacial fill in the McKenzie River valley. Valley fills have been drilled to 146 feet in the Blue River area, and 175 feet in the McKenzie Bridge area (Williamson 1961 as cited in the Upper McKenzie Watershed Analysis 1995).
- Of the streams that do have surface connection to ESA-listed fish habitat, most of them are intercepted by roads. If debris makes it past those roads, the flat glacial terrace acts as a depositional area and stores most of the debris before reaching listed fish habitat.
- There are only six units adjacent to fish-bearing streams with MIS (Units 90, 130, 150, 530, 550, and 600) and primary wood recruitment zones are protected on all of them. Full stream influence zone protection (172 feet) would occur on half of them (Units 90, 130, and 530).

Hazardous fuels treatment units are located adjacent to the McKenzie River and Lost Creek, but no treatment would occur within the steam influence zone (0-172 feet). Therefore, there would be no impacts to ESA-listed fish or MIS or their habitat from these activities.

Conditions in currently functioning portions of Riparian Reserves would be maintained. In overstocked, conifer-dominant portions lacking structural and species diversity, thinning would occur in upland units with tributary streams to ESA-listed fish habitat and along six units with MIS. The desired benefit of thinning in Riparian Reserves is to improve stand structure, vegetation diversity, and accelerate development of large diameter trees to acquire desired vegetation characteristics needed to attain ACS Objectives (Appendix E). Management of these stands would accelerate the ability of Riparian Reserves to provide adequate stream shade, root strength and bank stability, sediment filtration and nutrient cycling, large wood supply to waterbodies and floodplains, organic matter input, and habitat for riparian-dependent wildlife. As this landscape rarely transports the products of disturbance, recruited material has little opportunity to migrate to ESA-listed fish habitat. Improvements in riparian stand diversity are expected to be of greatest benefit to MIS, primarily cutthroat trout.

Cumulative Effects

Alternatives 2 and 3 Cumulative Effects

All recent and planned timber harvest and hazardous fuels reduction projects were and would be designed with similar protection measures, design features, and Best Management Practices that minimize effects to water quality and aquatic resources. Each of the past projects listed in Appendix D were analyzed for effects to riparian condition and were found to have no effect, negligible effect, or beneficial effect. The negligible or beneficial effects combined with the minor impacts expected from the Goose project would not measurably contribute to impaired riparian conditions.

Eugene Water and Electric Board’s transmission line corridor runs through the project area and crosses approximately 17 streams in the project area. This corridor is maintained in an early-seral condition, reducing shade and potential wood recruitment. The total area of adverse effect within Riparian Reserves of the project area is approximately 10 acres (0.2 percent). This minor amount of affected area combined with the minor impacts expected from the Goose project would not measurably contribute to impaired riparian conditions.

3.5 Wildlife

3.5.1 Summary of Effects Analysis

Summary of Effects: The effects of Alternatives 2 and 3 were compared to the No-Action alternative (Alternative 1) for the following wildlife species or categories: a) Northern Spotted Owl, b) Proposed Threatened species, c) Forest Service Sensitive Species, d) Survey and Manage species, e) Willamette National Forest Management Indicator Species, and f) Migratory Birds.

Northern spotted owl: Alternative 2 would harvest approximately 445 acres of suitable habitat, approximately1,508 acres of dispersal habitat, and approximately 103 acres of non-habitat. Alternative 3 would not harvest any suitable habitat, approximately 660 acres of dispersal habitat, and approximately 85 acres of non-habitat. Alternative 2 would also prescribe underburn in approximately 60 acres of suitable habitat. Alternatives 2 and 3 would implement hazardous fuels reduction in approximately 295 acres of suitable habitat, approximately six acres of dispersal habitat, and approximately 24 acres of non-habitat.

The Goose project may affect, and is likely to adversely affect the northern spotted owl (USFWS 2009).

Alternative 2 proposes to remove about two acres of high-quality suitable habitat in Critical Habitat (CH) for a temporary road of about 0.25 miles in length and two helicopter landing sites where logs would be delivered. The road and landings are needed to facilitate the harvest of Unit 10. The habitat removed is older forest that meets the characteristics of RA-32 (USFWS 2011). This road construction ***may affect***

and is likely to adversely affect 2012 CH because it would reduce the ability of CH to provide high quality suitable spotted owl habitat. Building the road and landing to access and thin the 392-acre Unit 10 would facilitate improving this habitat in the long-term (>25 years) by promoting faster tree growth and increased stand complexity.

Fuel Reduction Treatments (WUI) are planned on about 21 acres of suitable and four acres of non-habitat, respectively, within 2012 CH. WUI Fuel Reduction Treatments in suitable and non-habitat ***may affect, but is not likely to adversely affect 2012 spotted owl critical habitat*** because they would maintain the current functionality of suitable habitat, and would not delay the development of dispersal and forage habitat in non-habitat.

The planned commercial thinning in CH for the Goose project would not adversely affect dispersal habitat and would have mostly beneficial effects on future foraging and nesting/roosting habitat. However, because about 54 acres in total of larger gaps that are being created to benefit early seral habitat would measurably delay the development of future foraging habitat, the proposed Harvest Habitat Maintain thinning ***may affect and is likely to adversely affect 2012 spotted owl critical habitat.***

Proposed Threatened species: Fisher is not likely to currently inhabit the project area and thus, any effects to potential habitat are unlikely to occur. Older forest habitat modification may impact future potential habitat. With the potential for large down wood creation where it is currently scarce, Alternatives 2 and 3 may benefit potential Fisher habitat.

There would be a long-term benefit (>50 years) to future potential habitat from planned large down wood placement within approximately 505 acres with Alternative 2, and approximately 63 acres with Alternative 3. Recommended down wood enhancement for other units would also benefit potential Fisher habitat. Alternative 2 would harvest approximately 424 acres of forests over 80 years of age, which may impact future potential habitat because it would open stands and remove portions of the future down wood sources.

Forest Service Sensitive species: For Fringed Myotis and Townsend's big-eared bats, Johnson's Hairstreak butterfly, Cascade Axetail slug, and Harlequin Duck, Alternatives 2 and 3, considering direct, indirect, and cumulative effects, may impact individuals or their habitat, but are expected to maintain viable populations within the project area and at the Forest-scale, and are not likely to result in a trend to federal Endangered Species Act listing. The likelihood of noise disturbance or work occurring near the McKenzie River with the Harlequin Duck present is unlikely, but there could be temporary displacement if they are using habitat in the project area while project activities take place. There would be no impacts to the Crater Lake Tightcoil because all suitable habitat would be protected with a minimum of a 10m no-harvest and no-burn buffer. There would be no impact to the American Peregrine Falcon because no nest sites are known within disturbance distance of the project area.

Survey and Manage species: Alternatives 2 and 3 may impact suitable Oregon Megomphix habitat at low and moderate elevations below 3000' on approximately 2,409 and approximately 1,069 acres, which is about 17 and 8 percent, respectively, of the suitable habitat in the project area (about 13,925 acres below 3000'). While this may impact individual Megomphix snails, it is not expected to result in any issues for population viability of this species. Alternatives 2 and 3 would remove or thin approximately 424 and approximately 14 acres (footprint acres with skips included), respectively, of red tree vole habitat in stands over 80 years of age, but would not affect any documented red tree vole nest areas. Alternatives 2 and 3 would reduce red tree vole habitat quality with the hazardous fuels reduction activities on approximately 325 acres of stands over 80 years of age. Alternative 2 may also downgrade red tree vole habitat quality on 60 acres with natural fuels underburning in stands over 80 years of age. Alternative 2 would create approximately 43 acres of open habitat with the proposed regeneration harvest, which may enhance opportunities for Great Gray Owl foraging. Small gaps totaling approximately 281 acres may also improve Great Gray Owl foraging habitat opportunities. Alternative 3 would show less overall improvements for Great Gray Owl foraging habitat with approximately 111 acres of gaps created which may provide open foraging habitat opportunities.

Willamette National Forest Management Indicator Species: **Cavity Excavators and Deadwood Abundance-**Many of the plantations proposed for thinning in both alternatives have low or no large snags present currently, so few large snags are expected to be lost within those. Most of the snags that would be lost are within the 447 acres of older forested stands over 80 years of age that are part of Alternative 2. Some additional snags may be lost in the younger stands or in areas directly adjacent to them if they pose a safety hazard to the logging operation. Goose design features to create variable levels of snags ranging from 0-5 snags/acre (Table 13), and protect existing snags where possible would mitigate this effect. Also, the design features (Table 13) recommend post-harvest monitoring and falling 0-5 trees per acre if these levels are not present (Table 13), therefore, downed wood levels would initially increase on up to 4,405 and 3,961 acres of forest in Alternatives 2 and 3, respectively. The proposed Goose harvest alternatives would affect snags and downed logs on about 6 percent of the project area, and Alternatives 2 and 3 are both expected to maintain population viability of cavity excavator species in the project area, and not contribute to any loss of viability of these species at the Forest scale.

Elk- Based on an elk nutritional model (Rowland et al. 2013), regeneration harvest and small gaps in Alternatives 2 and 3 should increase elk forage quality from “poor “to “higher-marginal” for about 20 years on 932 and 473 acres, respectively.

Marten- Overall impacts to marten with Alternative 2 are judged to be discountable because of the extremely limited extent that unit 10 would affect the preferred higher elevation montane mixed forest that marten prefer. The recommended wildlife tree and large down wood habitat creation would improve these stands as marten habitat in the short-term (up to 50 years). Alternative 3 would not impact marten.

Migratory Birds-Alternatives 2 and 3 would provide 932 and 473 acres, respectively, of complex early seral habitat. This would benefit migratory birds which favor shrub habitat in early seral conifer stands, such as the Rufous hummingbird and purple finch. Snag retention and creation would benefit species such as olive-sided flycatcher, which favor forest openings with large snags.. Alternative 2 would allow some natural regeneration, with about 210 acres of 1-3 acre gaps not planted following harvest. This would benefit migratory birds that use this complex early seral habitat.

3.5.2 Scale of Analysis

The geographic scale used to assess direct, indirect and cumulative effects for early seral wildlife habitat includes three 6th field watersheds (Lost Creek, Florence Creek-McKenzie River, and Elk Creek-McKenzie River) and the project area. The geographic scale used to assess direct, indirect and cumulative effects for snags and down wood includes the project activity units and the Upper McKenzie River 5th field Watershed. The geographic scale used to assess direct, indirect and cumulative effects sensitive species, migratory land birds, and terrestrial MIS species was the project activity units and the project area. For threatened northern spotted owls, a 0.5 and 1.2 mile radius buffer around all pair activity centers for the spotted owl within the project area was used to determine available amounts of suitable and dispersal habitat. The geographic scale used to assess direct, indirect and cumulative effects for elk habitat includes the project activity units and four emphasis areas which management activities would occur in. These emphasis areas were used for the scope of analysis because of established ratings for elk habitat as described in the Willamette National Forest Plan Standards and Guidelines. These emphasis areas do include private lands.

3.5.3 Affected Environment – Early Seral Habitat for Wildlife

Age class diversity in forest stands is important as some species of animals and plants depend on younger stages of forests for their feeding, nesting, and breeding requirements, whereas other species thrive in middle age or old forests. Early seral habitat (defined as less than 20 years old) is of key importance to an estimated 156 species of wildlife in the central Oregon Cascades.

Historically, early seral habitat in the project area was created from stand-replacing fires and regeneration harvest. Changes in forest management on Federal lands in the past 30 years, including fire suppression and reduced regeneration harvest have resulted in fewer acres of early seral habitat creation. Additionally, fire suppression and reduced regeneration harvest have resulted in a much higher proportion of dense, closed canopy stands. Consequently, there is less structurally rich and diverse quality early seral habitat in the project area than in the past. Currently, early seral habitat within the Goose project area is only partially effective (marginal) at providing quality diverse early seral habitat due to the lack of vertical and horizontal stand structure. A small amount of early seral habitat is present surrounding rock outcrops in the higher elevations of the planning area. There are very few open meadows in the project area.

The Goose project area occurs in three 6th field watersheds: Lost Creek, Florence Creek-McKenzie River, and Elk Creek-McKenzie River. Within these watersheds, approximately 30,164 acres of forest land are managed by the Forest Service. Within this 30,164 acres only 43 acres (0.14%) is early seral habitat (less than 20 years old). Of the 43 acres of early seral habitat in these watersheds, 15 acres occur in the Goose project area. Eight acres are located in the Lost Creek watershed; six in the Florence Creek-McKenzie River watershed; and one in the Elk Creek-McKenzie River watershed.

3.5.4 Environmental Consequences – Early Seral Habitat for Wildlife

Direct and Indirect Effects

Alternative 1 – No Action

With implementation of Alternative 1, the amount of diverse early seral habitat in the Goose project area would continue to decrease over time as stands move from the early to mid-seral stage (Figure 25). The currently existing 43 acres of early seral habitat would transition to a mid-seral stage by about 2035, leaving no early seral habitat within the Goose project area. Natural tree mortality (insects, disease, wildfire, or blowdown) within Goose units is not expected to be significant or likely to produce many openings in the short-term (approximately 10 years) future, resulting in no noticeable increase in early seral habitat across the landscape.

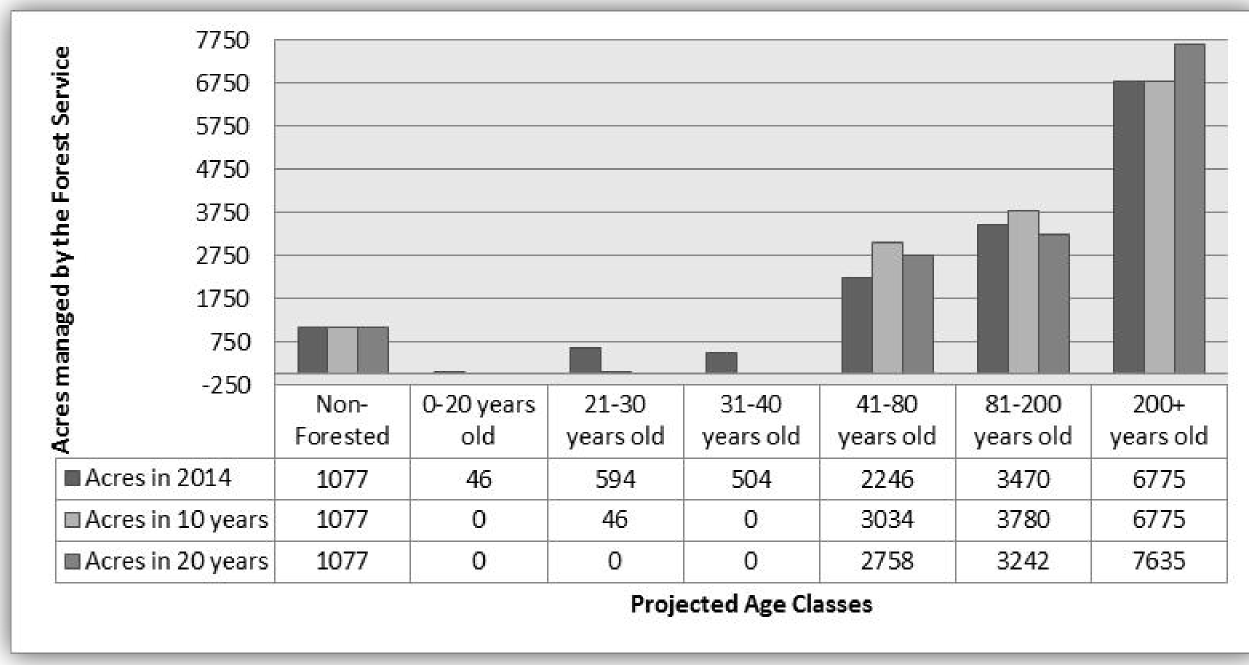

Figure 25. Projected Acres in Age Classes[1]

Alternative 2

Diverse early seral habitat would be created by cutting a total of approximately 281 acres of 1-to-3 acre gaps, approximately 43 acres of regeneration harvest, and approximately 50 acres of dominant tree releases (DTR). DTR would be lower quality early seral habitat due to the small 1/4 to 1/3 acre size of the openings. In total, the above treatments would increase the early seral habitat from approximately 43 acres to approximately 420 acres on federal land in the Goose project area. At the watershed level, this would increase early seral habitat from 0.14 percent to 1.5 percent. At the project level, this would increase early seral habitat from 0.11 percent to 3.2 percent. These acres would be expected to provide early seral habitat for 15-20 years. Post-harvest underburning would better improve shrub and forb development, and support the occurrence of more high quality early seral habitat.

Commercial thinning on approximately 1,218 acres would also increase use of the highly stocked forests and make them more suitable to a wider range of early seral-dependent wildlife species, compared to the current dense closed canopy condition. The 60 acres of the natural fuels underburn proposed would also supply lower quality early seral habitat through the fire disturbance. The commercial thinning and underburning would provide lower quality early seral habitat because stands would not be thinned heavily, and not enough light would reach the forest floor to create the high quality early seral habitat that many species rely on. The overall impact of the proposed action is that dense closed canopy mid-seral forests would be thinned to a more open condition with gaps that would provide diverse early seral habitat. These more open habitat conditions associated with the thinning are expected to last approximately 15-20 years, depending on the site and final canopy cover. Some species that would benefit from increased understory vegetation include Roosevelt elk, black-tailed deer, turkey vulture, sharp-shinned hawk, Cooper's hawk, California quail, long- and short-eared owls, Vaux's swift, Anna's hummingbird, rufous hummingbird, western bluebird, olive-sided flycatcher, as well as the overall avian biodiversity.

[1] Acreage of age class 0-20 years old (early seral habitat) in the project area was 46 acres in 2014 and 43 acres in 2015.

Harvesting fire regenerated stands with Alternative 2 would produce early seral habitat, compared to not harvesting in fire regenerated stands, and responds to the Purpose and Need 1.3.3 to Actively Manage Stands to Improve Conditions, Diversity, Density and Structure. The fire regenerated stands are in the stem exclusion stage, which is the least productive for early seral species.

Alternative 3

The effects of Alternative 3 are the same as Alternative 2, with Alternative 3 having fewer acres proposed for harvesting and underburning. There would be less acres of diverse early seral habitat created with Alternative 3. Early seral wildlife habitat would be created in approximately 111 acres of gaps and approximately 30 acres of dominant tree releases which would increase the total acres of early seral habitat to approximately 187 acres on Forest Service land in the Goose project area (approximately one percent).

Cumulative Effects

Alternative 2 and 3

The Goose project would be the first project to include any regeneration timber harvest on Forest Service lands in the project area since the early 1990s. No complex early seral habitat has been created by wild fires in the project area in the past 50 years. A 38 acre fire burned in the 1970s; however, it was mostly an understory burn that did not produce much early seral habitat. Two recently completed projects near the Goose project area (13 Thin and Eagle Timber Sales) included small gap treatments that created approximately 336 acres of early seral habitat. Cumulatively, early seral habitat created from the Goose project, 13 Thin, and Eagle Timber Sales would provide approximately 756 acres of early seral habitat.

3.5.7 Affected Environment – Northern Spotted Owl (Threatened)

The northern spotted owl is a federally threatened species under the Endangered Species Act (ESA) that uses forest habitat in the project area. The effects of the various proposed actions for the Goose project were addressed by the Willamette National Forest (2009) and evaluated by the U. S. Fish and Wildlife Service (USFWS) in the 2009 Biological Opinion (BO)(FWS reference 13420-2010-F-0001). Subsequently, Critical Habitat for the northern spotted owl was modified with the 2012 Critical Habitat Rule (USFWS 2012). This resulted in reinitiation of consultation (Willamette National Forest 2013) and an additional Biological Opinion (USFWS 2013)(FWS Reference Number 01EOFW00-2013-F-0115). This BO fulfills the Forest Service's legal requirement with respect to Section 7 of ESA for the Goose project. This FEIS tiers to this BO, as well as the Biological Assessment and letter requesting conference conversion after the designation of Critical Habitat (USDA Forest Service 2012) that supported the consultation. A summary of the effects of the alternatives on the northern spotted owl is provided in this section.

Consultation on the northern spotted owl was based on current survey information provided by the H J Andrews Spotted Owl Demographic Study Area (Forsman et al. 2011), past district wildlife survey data, and predicted owl sites. All spotted owl sites consulted on were based on current and historic information. A total of thirteen current and historic owl sites were consulted on and occur within 1.2 miles of the proposed harvest, prescribed natural fire, or hazardous fuels reduction units (USFWS 2010).

Interspecies Competition: The barred owl occurs throughout the Willamette National Forest. Competition with barred owls has been found to be an important threat to northern spotted owls (USFWS 2011). In western Oregon, both species prefer forests older than 120 years of age. The larger and more aggressive barred owls can displace spotted owls where they establish territories (Wiens 2012). Wiens (2012) has recommended retaining conifer forests older than 120 years of age as a method to reduce interspecific competition between the owl species. Where barred owls occur, he has found that spotted owl survival significantly declines as the percent of forests >120 years of age in the general home range drops below 35 percent.

Northern spotted owl habitat is classified as:

1. Suitable habitat that provides for nesting, roosting, and/or foraging, consisting of "…forested stands used by spotted owls for nesting, roosting and foraging. Features that support nesting and roosting typically include a moderate to high canopy closure (60-90 percent); a multi-layered, multi-species canopy with large overstory trees (with dbh of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly. This habitat is described as nesting and roosting habitat in the revised northern spotted owl recovery plan (USFWS 2011, p. A-10)." Suitable habitat can also function as dispersal habitat as it supports both territorial and dispersing spotted owls. Those units for the Goose project which were considered to be suitable spotted owl habitat provide for foraging and roosting with marginal potential for nesting due to the relatively young growth form of the upper canopy and the absence or relatively low number of legacy trees over 250 years old.
2. Dispersal-only habitat provides for protection from avian predators and at least minimal foraging opportunities during dispersal and colonization periods. Dispersal habitat consists of, at a minimum, stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities (USFWS, 2011, p. A-10). It is comprised of conifer and mixed mature conifer-hardwood habitats with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter at breast height (dbh) with open space beneath the canopy to allow spotted owls to fly. Generally, spotted owls use younger stands to move between blocks of suitable habitat, and to roost, forage and survive until they can establish a nest territory. Juvenile owls also use dispersal habitat to move from natal areas. Dispersal habitat thus includes habitat that would provide some roosting and foraging opportunities during the colonization phase of dispersal, but not at a scale that would support nesting pairs (Willamette National Forest 2009). While dispersal habitat is often referred to in a general sense as stands that are 40-79 years old, growing site conditions, tree spacing, elevation, stand size and landscape juxtaposition, precommercial thinning history, and stand structure, all play a role in the habitat a stand may provide at a particular age after harvest or other disturbance event.
3. Non-habitat refers to land which is capable of growing habitat, but does not currently function as either suitable or dispersal habitat.

The Goose units contain a mix of forest stand age classes and were classified into non-habitat, dispersal, and suitable spotted owl habitat based on aerial photos and field reviews conducted in 2009. Owl habitat mapping estimates there are currently about 7,337 acres of suitable habitat (50 percent), 4,363 acres of dispersal habitat (30 percent), and 2,978 acres of non-habitat (20 percent) in the project area (Table 30). In addition, there are 3,219 acres of private land scattered in a block like fashion throughout the center of the project area. These private lands make up about 18 percent of the total project area and are assumed to be non-habitat for spotted owls, thus were not incorporated into the spotted owl analysis or numbers represented in Table 30 shown below.

Table 30. Spotted Owl Habitat Type Distribution by Acres and Percent in Goose Project Area

	Suitable Acres	Dispersal Acres	Non-Habitat Acres	[1]Total
Goose Project Area	7,337 or 50%	4,363 or 30%	2,978 or 20%	14,678 (100%)

[1] These acres are only a reflection of spotted owl habitat classifications within the project area and do not reflect all the acres in the project area; they do not include acres which are highly unlikely to function as spotted owl habitat such as large rock outcrops, or private lands. There are an estimated 35 acres of non-capable lands and 3,219 acre of private lands in the project area.

Effects of habitat modification on individual northern spotted owl sites are assessed at three spatial scales: the home range, core area, and nest patch.

Home Range – A home range in the Oregon Cascades Province is a 1.2 mile radius circle (2,955 acres) centered on an activity center (i.e. nest site). It is used by northern spotted owls to obtain cover and food, and for reproduction and rearing of young. Home ranges of multiple northern spotted owl pairs may overlap with habitat shared between adjacent resident northern spotted owl pairs and dispersing northern spotted owls. These areas are important for the survival and productivity as northern spotted owls are non-migratory.

Core Area – Within the home range, the core area (500 acres) is a 0.5 mile radius circle centered on the activity center, representing the area most heavily used during the nesting season (USDI USFWS et al. 2008). The core area is defended by territorial northern spotted owls and generally does not overlap the core areas of other northern spotted owl pairs.

Nest Patch – Within the core area, the nest patch (70 acres) is defined as a 300 meter radius circle around the activity center (USDI USFWS et al. 2008). The two key elements of habitat within a nest patch are: (1) canopy closure of dominant, co-dominant, and intermediate conifer and hardwood trees and (2) the amount of down wood (USDI USFWS et al. 2008). Modification of habitat within this area is considered likely to affect the reproductive success of nesting northern spotted owls and is used in determination of incidental take (USDI USFWS et al. 2008). There are no proposed units that overlap nest patches.

The U.S. Fish and Wildlife Service (USFWS) have determined viability thresholds of 50 percent suitable habitat in the core area and 40 percent suitable habitat in the home range, respectively. Suitable habitat levels below these thresholds are thought to compromise the reproductive success of owls (USDI USFWS et al. 2008). Owls may successfully fledge young when suitable habitat drops below these percentages, but the likelihood of this decreases as suitable habitat declines.

3.5.8 Environmental Consequences – Northern Spotted Owl (Threatened)

The effects of the Goose project on the northern spotted owl are described below by**:**

- Northern Spotted Owl Habitat
- Northern Spotted Owl Critical Habitat
- Known Owl Sites
- Disruption

Northern Spotted Owl Habitat

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would have no effect on spotted owl habitat. Non-habitat plantations would slowly develop into dispersal habitat within another 10-15 years as the stands thin themselves. Those stands which are currently dispersal habitat would develop into low quality foraging habitat within 40-50 years. Stands which currently have larger remnant trees of larger diameters could become low quality nesting habitat within that timeframe as well. The stands which are currently foraging habitat with some nesting opportunity would develop towards old growth conditions and start to become high quality suitable owl habitat fitting Recovery Action 32 stand characteristics in about 50-100 years.

Alternative 2

Alternative 2 would treat a mix of age classes with various treatment types to meet the purpose and need of the Goose project. Table 31 displays Alternative 2 proposed treatments by age class, treated acres, and type of treatment. Table 32 shows treated acres by spotted owl habitat type and treatment type. It should be noted that more acres were analyzed and consulted on with the U.S. Fish and Wildlife Service for habitat modification and removal than the final actual acres proposed for these treatments. Consultation acres and effects included the entire unit footprint. Project field surveys and planning resulted in areas within that original unit footprint that would be left unharvested for a variety of reasons such as riparian protections for the Crater Lake Tightcoil or water quality, botanical concerns, and/or landscape skips. Thus, effects to owls have been reduced compared to the overall unit footprint acres shown below. These effects are dependent on where they lay on the landscape, and how they connect to other habitat types.

Table 31. Age Class Acres by Treatment Type – Alternative 2

Regeneration (Shelterwood) Units	Actual Acres of Regeneration-Shelterwood (skips included)
15-40 years	0
41-80 years	0
81-127 years	43
Total	**43**
Thinning Units	**Actual Acres of Treatment Thinning, Gaps, Skips and Dominant Tree Release**
15-40 years	297
41-80 years	1,020
81-127 years	232
Total	**2,003**
Prescribed Underburning Units	**Treatment Acres**
Over 120 years old	60
Hazardous Fuels Reduction Units	**Treatment Acres**
Over 120 years old	325

Treatments in Suitable Habitat: Alternative 2 would remove about 43 acres or less than 1 percent of suitable owl habitat in the project area, making the habitat unsuitable for spotted owls. In about 40 years post-harvest, these stands would develop into dispersal habitat. Retention of 25 large trees per acre with a regeneration shelterwood harvest would allow these stands to provide higher quality dispersal habitat compared to what would occur in a regeneration harvest without leave tree retention. Suitable owl habitat would develop after 80 to 140 years post-harvest, and the stand could achieve characteristics that fit the Recovery Action 32 description due to the retention of legacy trees that would exist in the stands at that time. This would especially be true if large snags and down wood are present.

Alternative 2 proposes three underburn units. The intent of these treatments is to return fire to the ecosystem. Units 800, 810, and 820 totaling 60 acres are currently functioning as suitable spotted owl habitat. The return of fire to these stands may downgrade the habitat to a 40 percent canopy closure and thus a dispersal habitat function. This may affect and is likely to adversely affect and harm two northern spotted owl sites (Willamette National Forest 2009, p.47).

Both Alternatives 2 and 3 include hazardous fuels reduction on about 295 acres of suitable owl habitat. While removal of the <10" diameter understory may affect habitat for the spotted owl prey base in the understory, overall suitable habitat functionality is expected to be retained.

Treatments in Dispersal Habitat: About 1,508 acres of dispersal habitat would be moderately or heavily thinned. Units proposed for moderate thinning which maintain an average of approximately 40 percent canopy cover are expected to close their canopies back to pre-harvest conditions within 7-10 years. However, habitat suitability for flying squirrels, the main prey of spotted owls in the central Oregon Cascades, may not recover even after 11-13 years post-thinning (Manning et al. 2012). Units with heavier thinning treatments and lower average canopy retention near 30 percent would need approximately 10-15 years to reclose their canopies back to pre-harvest conditions. Dispersal habitat units with proposed regeneration harvest treatments would reach dispersal habitat conditions about 40 years post-harvest. Thinning harvest treatments are planned on 1,508 acres or 35 percent of the dispersal habitat in the project area. Thinning of dispersal habitat would benefit overall forest structural development and improve long-term (>25 years) spotted owl habitat conditions. Post-harvest snag and large down wood habitat mitigation and enhancement in the 43 acres of regeneration harvest and selected thinning units would improve stand structure conditions even more for spotted owls and their prey in the long-term.

Treatments in Non-Habitat: Approximately 103 acres (~three percent) of forest stands that are currently non-habitat for spotted owls in the project area would be thinned. This treatment would benefit spotted owls because forest structure would be improved over the current condition. Thinning of these stands would allow them to develop into dispersal habitat conditions faster than if they were left to develop naturally. Structural enhancements such as snag and down wood placement would further benefit spotted owl habitat quality. This would improve this habitat in the near future and longer term.

Recovery Action 32 of the 2011 Revised Recovery Plan for the northern spotted owl identified a need to maintain older, more structurally complex multi-layered conifer forests containing large diameter trees, high amounts of canopy cover, and decadence components such as broken topped trees, mistletoe, large snags, and fallen trees (U.S. Fish and Wildlife Service 2011). Guidance for identifying such stands has been developed for the Willamette National Forest with review by USFWS and Bureau of Land Management (Doerr 2012). No Recovery Action 32 (RA32) habitat occurs within the proposed treatment areas with the exception of a temporary spur road that would harvest about 2 acres of suitable owl habitat to provide access to unit 10. This road is also within 2012 Critical Habitat and is discussed under that section below.

Table 32. Treated Acres by Spotted Owl Habitat Type and Activity – Alternatives 2 and 3

Spotted Owl Habitat Type(s)	Suitable Acres		Dispersal Acres		Non-habitat Acres	
	Alternative 2	Alternative 3	Alternative 2	Alternative 3	Alternative 2	Alternative 3
Harvest Acres	445	0	1,508	660	103	85
Prescribed Underburning	60	0	0	0	0	0
Hazardous Fuels Reduction	295	295	6	6	24	24
Total Treated Acres	800	295	1,514	666	127	109

Alternative 3

Treatments in Suitable Habitat: Alternative 3 does not harvest or underburn any suitable spotted owl habitat. Not harvesting the currently suitable owl habitat would maintain this habitat and the structural dead wood elements. At the same time, not thinning these stands would also not improve stand diversity and structure in the short term (approximately 10 years). Over time (after about 20-30 years or more), these stands would grow into higher quality suitable owl habitat by natural stand competition which would allow for growth of larger trees and provide some dead wood mortality which would benefit the prey base of spotted owls. In the short and long term, suitable owl habitat functionality would be maintained.

Both Alternatives 2 and 3 include hazardous fuels reduction on about 295 acres of suitable owl habitat. While removal of the <10” diameter understory may affect habitat for the spotted owl prey base in the understory, overall suitable habitat functionality is expected to be retained.

Treatments in Dispersal Habitat: About 660 acres of dispersal habitat would be moderately or heavily thinned. Units proposed for moderate thinning which maintain an average of approximately 40 percent canopy cover are expected to close their canopies back to pre-harvest conditions within 7-10 years. However, habitat suitability for flying squirrels, the main prey of spotted owls in the central Oregon Cascades, may not recover even after 11-13 years post-thinning (Manning et al. 2012). Units with heavier thinning treatments and lower average canopy retention near 30 percent would need approximately 10-15 years to reclose their canopies back to pre-harvest conditions. Dispersal habitat units with proposed regeneration harvest treatments would reach dispersal habitat conditions about 40 years post-harvest. Thinning harvest treatments are planned on 660 acres or 15 percent of the dispersal habitat in the project area. Thinning of dispersal habitat would benefit overall forest structural development and improve long-term (>25 years) spotted owl habitat conditions. Post-harvest snag and large down wood habitat mitigation and enhancement in selected thinning units would improve stand structure conditions even more for spotted owls and their prey in the long-term.

Treatments in Non-Habitat: Approximately 83 acres (~three percent) of forest stands that are currently non-habitat for spotted owls in the project area would be thinned. This treatment would benefit spotted owls because forest structure would be improved over the current condition. Thinning of these stands would allow them to develop into dispersal habitat conditions faster than if they were left to develop naturally. Structural enhancements such as snag and down wood placement would further benefit spotted owl habitat quality. This would improve this habitat in the near future and longer term.

Cumulative Effects

Alternative 1 – No Action

Alternative 1 would have no direct on spotted owl habitat, so there are no cumulative effects to be considered.

Alternative 2

In considering direct, indirect, and cumulative effects, Alternative 2 may affect and is likely to adversely affect northern spotted owl habitat, but would not jeopardize the continued existence of the spotted owl. There are no other reasonably foreseeable or ongoing projects that would remove older forest habitat in that watershed. Alternative 2 would not preclude meeting recovery goals for spotted owls and the landscape would still support provide suitable and dispersal spotted owl habitat post-treatment.

Alternative 3

Similar to Alternative 2, considering direct, indirect, and cumulative effects, Alternative 3 may affect spotted owl habitat, but would not jeopardize the continued existence of the spotted owl. Alternative 3 would not preclude meeting recovery goals for spotted owls and the landscape would still support nesting spotted owls and dispersal post-treatment.

Northern Spotted Owl Critical Habitat (CH)

The Goose project was planned and consulted on prior to the release of the (revised) 2012 Critical Habitat boundaries. After the revised 2012 northern spotted owl critical habitat rule was released, the project was re-evaluated and it was determined that a portion of the project was located in 2012 Critical Habitat Unit West Cascades South, subunit WCS 3, which totals approximately 319,736 acres. Reinitiation of consultation for that portion of the Goose project within the revised Critical Habitat and effects to northern spotted owl habitat took place (Willamette National Forest 2013; USFWS 2013) (FWS reference: 01EOFW00-2013-F-0115). Alternatives 2 and 3 were slightly modified to reduce effects in Critical Habitat (Willamette National Forest 2013, p. 11):

Unit 810 was planned as a 12-acre underburn in a stand of suitable habitat. The intent was to reintroduce a low-intensity fire into this stand. Because prescribed fire is not an exact science, there was a small possibility that the burning would temporarily reduce the stand to dispersal habitat. This could occur if there is mortality to overstory canopy trees such that the canopy cover would become too open (<60 percent) to be considered suitable spotted owl habitat. Depending on the severity of the overstory canopy loss and the size of the burned habitat patch, this habitat could again become suitable habitat once the understory closes back in which could occur within 40 years if the patch is small, i.e. under three acres. If the burned area is larger, it could take 80-100 years for the habitat to again be suitable spotted owl habitat. The temporary loss of this suitable habitat would contribute to harm to two nest sites (MSNO 2034 and 2836) for which incidental take was received. Because of the CH designation, the Forest Service has decided to drop this unit from underburning. *Note: Only the portion of this unit which was within CH has been dropped, the remaining 17 acres would still be underburned.*

Three minor mapping errors totaling 1.4 acres in units 60, 160, and 330 will be corrected. These are the results of imprecise GIS database mapping.

The following summary of effects and discussion (Alternative 2) is specific to treatments which would occur in Northern Spotted Owl Critical Habitat Unit Cascades South, subunit WCS3. It should be noted that some of these treatment acres and effects have been discussed previously, although those discussions included additional acres and areas not within designated critical habitat.

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would have no effect on spotted owl Critical Habitat. Non-habitat plantations would slowly develop into dispersal habitat within another 10-15 years as the stands thin themselves. Those stands which are currently dispersal habitat would develop into low quality foraging habitat within 40-50 years. Stands which currently have larger remnant trees of larger diameters could become low quality nesting habitat within that timeframe as well. The stands which are currently foraging habitat with some nesting opportunity would develop towards old growth conditions and start to become high quality suitable owl habitat fitting Recovery Action 32 stand characteristics in about 50-100 years.

Alternative 2

Suitable Habitat Removal for Road Construction in Suitable RA32 Habitat in Critical Habitat
About two acres of high-quality suitable habitat are proposed for removal in WCS 3 for a temporary road of about 0.25 miles in length and two helicopter landing sites where logs would be delivered. The road and landings are needed to facilitate the harvest of Unit 10. The habitat removed is forest that meets the characteristics of Recovery Action 32. Following harvest in Unit 10, the road and landings would be closed and allowed to regenerate. This action was evaluated in detail in the original Biological Opinion for the Goose Timber Sale (USFWS 2009). Loss of two acres of suitable habitat was determined to have an adverse effect to owls, and this activity may affect, and is likely to adversely affect 2012 CH.

USFWS (ibid.:109) concluded that two acres was a very small fraction of the total RA32 habitat available on the Forest. The road and landing was needed to conduct variable density thinning in Unit 10. Unit 10 is a 392-acre, fire-regenerated stand of dispersal habitat that is in poor timber health, slowly-growing, and susceptible to disease, insect outbreaks, and fire. The proposed thinning is expected to promote multiple canopies, faster tree growth, and greater stand complexity. USFWS (ibid.) concluded that treatment planned in Unit 10 would benefit future owl critical habitat. The loss of two acres to road and landing construction is the only older forest habitat that is impacted in WCS 3 by the Goose project.

Recovery Action 32 was developed to address the threat from barred owls. Interspecific competition between barred and spotted owls is a complex situation that is difficult to quantify. Wiens (2012, Figure 3.12 p. 100) has developed a predictive relationship of 6-month survival based on the proportion of old (>120 years) forest in the home range. He has found that survival rates for spotted owls begin to decline when the proportion of old forest in the home range drops below 35 percent. A loss of two acres represents only a 0.07 percent change in the proportion of old forest habitat in a 1.2-mile radius home range. Based on the information provided by Wiens (2012), this very small decrease in old forest habitat would not produce a measureable change in spotted owl survival nor a meaningful increase in competition with barred owls.

Recovery Action 32 in the 2011 Revised Recovery Plan (USFWS 2011: III-67) recommends that land managers work with USFWS to maintain and restore RA32 habitat while allowing threats such as fire and insects to be addressed by restoration management activities. Both the 2011 Recovery Plan and the 2012 CH rule encourage restoration activities such as the treatment of Unit 10. The impact to two acres of RA 32 habitat is consistent with the 2011 Recovery Plan and the 2012 CH rule due to the long-term (>25 years) benefit to owl habitat from treating Unit 10. However, the proposed 2-acre road construction may affect, and is likely to adversely affect 2012 CH because it would reduce the ability of CH to provide high quality suitable spotted owl habitat (USFWS 2013).

Harvest Habitat Maintain-Dispersal and Non-habitat in Critical Habitat

The objectives of the commercial thinning in stands less than 80 years of age, as identified in the Goose Project Environmental Assessment (USFS 2010) and including those that are now in 2012 CH, were to increase stand health and vigor, increase the potential for Riparian Reserves to function as late successional habitat, provide a sustainable supply of timber products, and, where larger gaps were created, increase the amount of early seral habitat. About 506 and 7 acres of Harvest Habitat Maintain thinning is planned in dispersal and non-habitat, respectively, in CH Subunit WCS 3, all in AMA.

Commercial thinning is expected to increase diameter growth and crown development of retained trees by reducing competition for resources. In dispersal and non-habitat, this treatment is expected to facilitate the growth of trees that would become nest and roost trees sooner than if no treatment occurred. In stands of dispersal habitat that are commercially thinned, there would be some short-term (7-10years) reduction in cover used for dispersal habitat. Also the reduction in overstory and mid-story cover would likely cause a short-term (7-10 years) reduction in the abundance of owl prey species that facilitates use of the stand for dispersal. None of these reductions is expected to prevent use of the stand for dispersal habitat by owls in short-term (7-10 years). Thinning is expected to provide greater structural complexity and prey abundance in the long-term (>25 years) than if left untreated. In non-habitat, the treatments would not delay the development of dispersal habitat and are expected to accelerate it by growing trees faster and creating space under the canopy of densely-stocked stands for owls to fly and hunt. Dead wood is retained following Forest Plan standards, and additional snags and downed wood creation planned in Units 10 and 30 would help provide for a spotted owl prey base.

About 54 acres of the commercial thinning in dispersal habitat in CH are gaps greater than one acre in size that are designed with the purpose of maintaining early seral habitat. These areas would only have about 6 trees/acre retained in the openings. These openings are large enough that it is expected that they would limit future use as red tree vole and flying squirrel habitat until the second release of conifers has grown up to where it would provide for those species. The loss of these two key prey species is expected to delay the development of future foraging habitat for at least several decades in those openings. This delay is expected to adversely affect CH. The remaining portions of the thinned units are expected to provide higher quality future foraging habitat than if left untreated.

The trees retained in the gaps are expected to develop large, deep crown structures that would provide future sites for roosting and possibly nesting. The forest that regenerates in the gaps, with only about 6 leave trees/acre, would initially have fewer future large trees than typical late successional forests which average 8 or more such trees (USFS 1986). While the number of large trees would be less, gap creation, as designed for the Goose project, should not delay the development of future roosting and nesting habitat because some suitable structures are expected to be provided.

The 7 acres of commercial thinning in non-habitat is expected to have long-term (>10 years) beneficial effects by increasing tree diameter growth and crown development which would accelerate the development of nest and roost structures and foraging and nesting/roosting habitat. These treatments have no gaps greater than one acre.

Overall, commercial thinning is a beneficial example of active forest management addressed in Recovery Action 10 because the treatments foster long-term (>10 years) forest health resiliency and restoration. The actions are consistent with long-term (>30 years) restoration goals of the Recovery Plan. The actions do not affect the management of existing large, continuous blocks of late-successional forests and would accelerate the development of some mid-seral habitat toward old forest conditions, especially the 392-acre stand that comprises Unit 10. The proposed commercial thinning is consistent with new ecological forestry for moist forests that recommends thinning younger forests to accelerate development of structural complexity (Franklin and Johnson 2012). The larger gaps created on about 54 acres responds beneficially to new concepts of ecological forestry to address needs of early seral species (Swanson et al. 2010, Franklin and Johnson 2012). The NSO Recovery Plan recognizes a need for active forestry to improve ecological conditions including restoration of high-quality early seral habitat (e.g. USFWS 2011:III-46). The CH rule (USFWS 2012:146) recommends that such treatments occur in stands that are not high-value owl habitat and in land designations where more traditional forest management is conducted. The planned gaps in the Goose project in young dispersal habitat avoid high-value owl habitat according to the CH recommendation. It should be noted that the Goose project was developed before the designation of 2012 proposed and final CH. The commercial thinning would not impair the functionality of any owl home ranges.

The planned commercial thinning in CH for the Goose project would not adversely affect dispersal habitat and would have mostly beneficial effects on future foraging and nesting/roosting habitat. However, because about 54 acres of larger gaps that are being created to benefit early seral habitat would measurably delay the development of future foraging habitat, the proposed Harvest Habitat Maintain thinning may affect and is likely to adversely affect 2012 spotted owl critical habitat.

WUI Fuel Reduction Treatment in Critical Habitat

About 23 and 4 acres of WUI Fuel Reduction Treatment are planned in suitable and non-habitat, respectively, in 2012 CH. The treatment is intended to reduce the vertical and horizontal continuity of fuels to create defensible space near human-built structures. The BO for this activity (USFWS 2009:94) found that removal of small diameter material less than 7 inches (in diameter) for the chipping and burning would maintain the functionality of the suitable habitat after treatment. In addition, the treatment would reduce the risk of unintended burning of the habitat. The NSO Recovery Plan and the CH rule both recognize that treatments may be needed to reduce fire risks in spotted owl habitat (USFWS 2011, 2012). Because the treatments reduce understory cover, but maintain the overall functionality of the habitat, the WUI Fuel Reduction Treatments in suitable and non-habitat may affect, but is not likely to adversely affect 2012 spotted owl critical habitat.

Effects to Nest Patches and Nesting Pairs in Critical Habitat

The original consultation for the Goose project showed no activities planned within the 300-meter nest patch of known and predicted owl sites (USFWS 2009). After unit layout, about 0.19 acres of Unit 10 overlap the 300-meter radius perimeter around MSNO 2034 in one area that is now in CH. The overlap extends about 75 feet into the nest circle perimeter and would thin dispersal habitat maintaining the habitat as dispersal. The habitat where the overlap occurs is on the edge of a rocky area that is separated from the forest stand surrounding the nest by about 100 meters of small patches of open meadows separated by stringers of trees. Thus, although Unit 10 is slightly within a hypothetical 300-meter nest patch, it is actually separated from the actual nest patch by topography and natural separations between the forest blocks comprising Unit 10 and the nest patch, respectively. The original consultation for the Goose project included incidental take for two seasons at MSNO 2034 (incorrectly written as MSNO 2036 on USFWS 2009:114 of the BO) due to helicopter yarding disturbances, and included incidental take due to harm to MSNO 2036 caused by loss of suitable habitat from treatment activities mostly outside of what is not 2012 CH. The current layout of Unit 10 and its effects to owl nesting habitat and MSNO 2034 is consistent with the original consultation for the project.

Alternative 3

Suitable Habitat Removal for Road Construction in Suitable RA32 Habitat within Critical Habitat

There would be no removal of any suitable spotted owl habitat or RA32 habitat with Alternative 3.

Harvest Habitat Maintain-Dispersal and Non-habitat in Critical Habitat

The objectives of the commercial thinning in stands less than 80 years of age, as identified in the Goose Project Environmental Assessment (USFS 2010) and including those that are now in 2012 CH, were to increase stand health and vigor, increase the potential for Riparian Reserves to function as late successional habitat, provide a sustainable supply of timber products, and, where larger gaps were created, increase the amount of early seral habitat. About 63 acres of Harvest Habitat Maintain thinning is planned in dispersal habitat in CH Subunit WCS 3, all in AMA, compared to 505 acres in Alternative 2.

Commercial thinning is expected to increase diameter growth and crown development of retained trees by reducing competition for resources. In dispersal habitat, this treatment is expected to facilitate the growth of trees that would become nest and roost trees sooner than if no treatment occurred. In stands of dispersal habitat that are commercially thinned, there would be some short-term (7-10years) reduction in cover used for dispersal habitat. Also the reduction in overstory and mid-story cover would likely cause a short-term (7-10 years) reduction in the abundance of owl prey species that facilitates use of the stand for dispersal. None of these reductions is expected to prevent use of the stand for dispersal habitat by owls in short-term (7-10 years). Thinning is expected to provide greater structural complexity and prey abundance in the long-term (>25 years) than if left untreated.

About 10 acres of commercial thinning in dispersal habitat in CH are gaps greater than one acre in size that are designed with the purpose of maintaining early seral habitat. These areas would only have about 6 trees/acre retained in the openings. These openings are large enough that it is expected that they would limit future use as red tree vole and flying squirrel habitat until the second release of conifers has grown up to where it would provide for those species. The loss of these two key prey species in these habitat patches is expected to delay the development of future foraging habitat for at least several decades in those openings. *This delay is expected to adversely affect CH.* The remaining portions of the thinned units are expected to provide higher quality future foraging habitat than if left untreated.

Trees retained in the gaps are expected to develop large, deep crown structures that would provide future sites for roosting and possibly nesting. The forest that regenerates in the gaps, with only about 6 leave trees/acre, would initially have fewer future large trees than typical late successional forests which average 8 or more such trees (USFS 1986). While the number of large trees would be less, gap creation, as designed for the Goose project, should not delay the development of future roosting and nesting habitat because some suitable structures are expected to be provided.

The planned commercial thinning in CH for the Goose project would not adversely affect dispersal habitat and would have mostly beneficial effects on future foraging and nesting/roosting habitat. However, because about 10 acres of larger gaps that are being created to benefit early seral habitat would measurably delay the development of future foraging habitat, the proposed Harvest Habitat Maintain thinning *may affect and is likely to adversely affect 2012 spotted owl critical habitat.*

WUI Fuel Reduction Treatment in Critical Habitat

About 23 and 4 acres of WUI Fuel Reduction Treatment are planned in suitable and non-habitat, respectively, in 2012 CH (units 950 and parts of 960). The treatment is intended to reduce the vertical and horizontal continuity of fuels to create defensible space near human-built structures. The BO for this activity (USFWS 2009:94) found that removal of small diameter material less than 7 inches (in diameter) for the chipping and burning would maintain the functionality of the suitable habitat after treatment. In addition, the treatment would reduce the risk of unintended burning of the habitat. The NSO Recovery Plan and the CH rule both recognize that treatments may be needed to reduce fire risks in spotted owl habitat (USFWS 2011, 2012). Because the treatments reduce understory cover, but maintain the overall functionality of the habitat, the WUI Fuel Reduction Treatments in suitable and non-habitat *may affect, but is not likely to adversely affect 2012 spotted owl critical habitat.*

Effects to Nest Patches and Nesting Pairs in Critical Habitat

There would be no effects to any spotted owl nest patches or nesting pairs in Critical Habitat with Alternative 3.

Cumulative Effects

Cumulative effects are those effects of future State or private activities (not involving Federal activities) that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 Definitions). A Memorandum to the Director of Fish and Wildlife Service, August 27, 1982, Cumulative Effects to be Considered Under Section 7 of the Endangered Species Act set forth the legal requirements for consideration by federal agencies of the cumulative effects:

"A non-federal action is reasonably certain to occur if the action requires approval of a state or local resource or land use control agency and such agencies have approved the action, and the project is ready to proceed...these indicators must show more than the possibility that the non-federal project will occur; they must demonstrate with reasonable certainty that it will occur."

Alternative 1 – No Action

There would be no effects to Critical Habitat from Alternative 1.

Alternative 2

One Critical Habitat Subunit, WCS 3, is affected by the proposed Goose actions. The environmental baseline includes the habitat effects of all projects in that Subunit that the Forest Service is aware of having been consulted at the time the Goose Supplemental BA was prepared. West Cascades South Subunit 3 (WCS 3) contains about 319,736 acres (USFWS 2012:217-218) that are nearly all in federal ownership, except for 184 acres of State lands that are managed primarily for recreation. The Forest Service is not aware of any foreseeable actions on these State lands that would affect critical habitat. This BA addresses silviculture treatments on about 542 acres in this CH subunit, which represents 0.17 percent of the subunit. About 7 and 506 acres of proposed treatments are precommercial thinning in young plantations (non-habitat) and dispersal habitat, respectively, that would largely maintain the current habitat function and do not affect the function of any owl home ranges. About 27 acres of planned WUI Fuel Treatment are also expected to maintain the functionality of the existing habitat. However, about 54 acres of gaps larger than one acre that would be created in thinning units in dispersal habitat would likely delay the development of future foraging habitat for several decades or more on those acres.

Two acres of high-quality suitable habitat would be lost to construction of a temporary road and two helicopter landing sites needed to efficiently harvest Unit 10. This loss of suitable habitat represents 0.001 percent of the suitable habitat in WCS 3 and would have a negligible effect to overall owl habitat within the CH subunit and a negligible effect on increased competition between barred owls and spotted owls. Thinning in Unit 10 would likely result in long-term improvements to dispersal and suitable habitat on about 306 acres (calculated from the unit acres minus the acres of planned skips and gaps). Over 189,000 acres of suitable habitat and 130 functional spotted owl territories with habitat above threshold levels would remain in WSC 3 after implementation of the Goose project (Willamette National Forest 2013). None of the planned activities would create any barriers to or hinder owl movement across the subunit or CH unit.

Given the amount of suitable habitat and functional home ranges that would remain after implementation, WCS3 would continue to provide demographic support to overall northern spotted owl populations and continue to provide north-south connectivity for owls between subunits in Unit 6 (West Cascades South).

Because the Goose project would remove 2 acres of suitable habitat and delay the development of foraging habitat on about 54 acres where larger gaps are created, the Goose project *may affect and is likely to adversely affect 2012 spotted owl critical habitat.*

In considering direct, indirect, and cumulative effects, the Goose project may affect and is likely to adversely affect northern spotted owls, but would not jeopardize the continued existence of the spotted owl. There are no other reasonably foreseeable or ongoing projects that would remove older forest habitat in that watershed. USFWS considered the effects of the Goose project on interspecific competition between barred owls and spotted owls in determining that the Goose project would not jeopardize the continued existence of spotted owls or adversely modify their critical habitat (USFWS 2012, p.37-39).

Adverse effects from helicopter noise are possible but limited to one owl site. Alternative 2 would not preclude meeting recovery goals for spotted owls and the landscape would still support nesting spotted owls and dispersal post-treatment.

Alternative 3

Similar to Alternative 2, considering direct, indirect, and cumulative effects, Alternative 3 may affect and is likely to adversely affect owls due to gap creation in Critical Habitat, but would not jeopardize the continued existence of the spotted owl. Alternative 3 would not preclude meeting recovery goals for spotted owls and the landscape would still support nesting spotted owls and dispersal post-treatment.

Known Owl Sites

Direct and Indirect Effects

Alternative 1 – No Action

Because Alternative 1 does not implement any future actions, there would be no effects on any known owl sites.

Alternative 2

While much of the project area is annually surveyed as part of the HJ Andrews Owl Demography Study, and many owl sites have been verified in recent years, others have not had evidence of pairs present in many years. While there are some areas that have not been surveyed in the past or have very outdated survey data due to the time and expense of conducting surveys, no additional owl sites or nesting pairs are expected to be present. This is due to the low amount of suitable nesting habitat present that does not already overlap a known or historic site.

Tables 33, 34, and 35 below display suitable and dispersal spotted owl habitat acres that would be removed or downgraded with Alternative 2 of the Goose project. It should be noted that acres shown are those which were used for the USFWS consultation (Willamette National Forest 2009) and have been reduced since that time due to small areas that were dropped within units for various resource concerns.

Table 33. Current and Alternative 2 Post-Treatment Condition of Suitable Habitat in Northern Spotted Owl Home Ranges in the Goose Project Area

Project Name	MSNO	Current NSO Habitat						Post Treatment NSO Habitat					
		300 meter (nest)		0.5 miles (core)		1.2 miles (home)		0.5 miles (core area)			1.2 miles (home range)		
		300 m acres	% suitable	0.5 mi acres	% suitable	1.2 mi acres	% suitable	Suitable acres reduced	0.5 mi acres	% suitable	Suitable acres reduced	1.2 mi acres	% suitable
Goose	0106	70	100%	452	90%	1,805	62%	0	452	90%	0	1,805	62%
	0835	45	64%	202	40%	944[2]	33%	0	202	40%	**9**	935[6]	32%
	0836	54	77%	273	54%	1,757	61%	0	273	54%	0	1,757	61%
	2034	54	78%	244	49%	1,020	35%	0	244	49%	**104**	917	32%
	2035	41	58%	344	68%	1,545	53%	**2**	342	68%	**122**	1,424	49%
	2417	26	37%	312	62%	1,318	46%	0	312	62%	0	1,318	46%
	2442	22	31%	162	32%	1,266	44%	0	162	32%	0	1,266	44%
	2825	38	54%	314	62%	1,551	54%	**23**	292	58%	**58**	1,493	52%
	2827	34	49%	223	44%	1,378	48%	0	223	44%	0	1,378	48%

[2] Of these, 39 acres are on private land, shown in BioMapper (Davis and Lint 2005) as "suitable habitat"

[2] Note acres shown are those used for the 2009 USFWS consultation. Suitable habitat acres reduced within the home range of MSNO 2836 have now been reduced to 18, with 1,141 acres remaining post treatment.

Project Name	MSNO	Current NSO Habitat						Post Treatment NSO Habitat					
		300 meter (nest)		0.5 miles (core)		1.2 miles (home)		0.5 miles (core area)			1.2 miles (home range)		
		300 m acres	% suitable	0.5 mi acres	% suitable	1.2 mi acres	% suitable	Suitable acres reduced	0.5 mi acres	% suitable	Suitable acres reduced	1.2 mi acres	% suitable
	2829	70	100%	392	78%	1,939	67%	0	392	78%	0	1,939	67%
	2836	49	70%	256	51%	1,159	40%	0	256	51%	**30**[2]	1,129	39%
	3400	69	99%	332	66%	1,611	56%	0	332	66%	**1**	1,610	56%
	3963	59	84%	398	79%	1,871	65%	0	398	79%	**16**	1,856	64%

No habitat is treated within the 300 meter nest patch. Master Site Numbers (MSNOs) anticipated to be harmed due to proposed suitable removal or downgrade to dispersal habitat in core areas or home ranges are shown in bold. Core areas below threshold of 50% suitable habitat are shown in orange. Home ranges below the 40% suitable habitat threshold are shown in pink. In post-treatment spotted owl habitat, those sites already below threshold levels (USFWS et al., 2008) but where no suitable habitat would be removed under this assessment are shown in a lighter shade of color (Willamette National Forest 2009).

Table 34. Alternative 2 Proposed Activities in Spotted Owl Habitat within 0.5 miles and 1.2 miles of Known Owl Sites in the Goose Project Area

Acres outside affected known or predicted owl sites are not shown in this table (Willamette National Forest 2009).

MSNO	Treatment	Current NSO Habitat	Matrix	AMA	Admin withdrawn	Total (Acres)
0835	HH Maintained	Dispersal		11		11
0836	HH Remove	Dispersal	6			6
	WUI	Suitable			1	1
2034	HH Remove	Dispersal		10		10
	HH Maintained	Dispersal		91		91
2035	HH Downgrade	Suitable		2		2
2825	HH Remove	Suitable	23			23
2836	HH Maintained	Dispersal		2		2
0106	HH Maintained	Dispersal		8		8
0835	HH Remove	Suitable	7			7
		Dispersal		49		49
	HH Downgrade	Suitable	2			2
	HH Maintain	Dispersal	24	133		157
	WUI	Suitable		14		14
		Dispersal		6		6
0836	HH Remove	Dispersal	118			118
	WUI	Suitable	20		34	53
2034[1]	HH Remove	Dispersal		31		31
	HH Downgrade	Suitable		102		102
	HH Maintain	Dispersal		751		751
	Underburn	Suitable		75		75
		Dispersal		4		4
	Road Construction	Suitable		2		2
2035	HH Remove	Suitable		11		11
	HH Downgrade	Suitable		110		110
	HH Maintain	Dispersal		54		54
2417	HH Maintain	Dispersal		107		107
	WUI	Suitable		130		130
2825	HH Remove	Suitable	41			41
		Dispersal	143	52		195
	HH Downgrade	Suitable	17			17
	HH Maintained	Dispersal	23	20		43
	WUI	Suitable	22			22
2829	WUI	Suitable	1		6	7
2836[2]	HH Remove	Dispersal		1		1
	HH Maintain	Dispersal		338		338
	Underburn	Suitable		29		29
		Dispersal		3		3

MSNO	Treatment	Current NSO Habitat	Matrix	AMA	Admin withdrawn	Total (Acres)
	Road Construction	Suitable		2		2
3400	HH Maintain	Dispersal		8		8
	Road Construction	Suitable		1		1
3963	HH Downgrade	Suitable		16		16

[1] Note acres shown are those used in the 2009 USFWS consultation. Suitable habitat acres treated in the home range of MSNO 2034 have been reduced to 57. This is due to a portion of the underburning in unit 810 being dropped due to being within Critical Habitat.
[2]Note acres shown are those used in the 2009 USFWS consultation. Suitable habitat acres treated in the home range of MSNO 2836 have been reduced to 13. This is due to a portion of the underburning in unit 810 being dropped due to being within Critical Habitat.

Table 35. Alternative 2 Effects to NSO Habitat as a Result of Habitat Modification by the Goose Project

Project Name	Activity	Current NSO Habitat	Post-Treatment NSO Habitat	LAA (acres)	NLAA (acres)	Total (acres)
Goose	HH Remove	Suitable	Non-habitat	78		**78**
		Dispersal	Non-habitat		371	**371**
	HH Downgrade	Suitable	Dispersal	331		**331**
	HH Maintain	Dispersal	Dispersal		1,351	**1,351**
	Underburn	Suitable	Dispersal	75[1]		**75**
		Dispersal	Non-habitat		4	**4**
	WUI Fuels Treatment	Suitable	Suitable		447	**447**
		Dispersal	Dispersal		164	**164**
	Road Construction	Suitable	Non-habitat	2		**2**
	HH Maintain	Dispersal	Dispersal		990	**990**
	Road Construction	Suitable	Non-habitat	61		**61**
Grand Total (acres)				**547**	**3,327**	**3,874**

(Willamette National Forest 2009, p.35)
[1] Note acres shown are those used in the 2009 USFWS consultation. Suitable habitat acres treated with the underburning in unit 810 have been reduced to 56 due to being within Critical Habitat.

Effects of Suitable Habitat Removed to Known NSO Sites

Removal of suitable habitat *may affect, and is likely to adversely affect* (direct and indirect), spotted owls because such harvest would remove suitable habitat and therefore decrease the amount of nesting, roosting, and foraging habitat for an owl pair.

There are no known or predicted spotted owl sites within 1.2 miles of unit 420 (27 acres). Goose units 471, 691, and 720 are within the home ranges of three known sites: MSNO 2035, MSNO 0835 and MSNO 2825. The proposed harvest would reduce canopy closure to 20 percent in MSNO 0835 thereby removing 10 acres of suitable habitat in this known site. The proposed harvest would reduce canopy closure to 20 percent in MSNO 2035 which would modify eleven acres of suitable into non-habitat. After treatment, this known site would have suitable habitat above the 50 percent threshold in the core area, but just under the 50 percent suitable habitat within the home range (49 percent) which indicates that this site may become unstable. Therefore, this activity may affect and is likely to adversely affect this known site by removing suitable habitat. However, it is not expected to harm this known site (USFWS 2009, p.78).

Units 720 and 691 would remove 23 acres of suitable habitat within the 0.5 mile core area and an additional 14 acres in the 1.2 mile home range. Therefore, proposed removal of 37 acres of suitable habitat may affect and is likely to adversely affect MSNO 2825 due to habitat loss. However, it is not expected to harm this known site since it is expected to remain viable after treatment, with suitable habitat above thresholds in both its core area and home range (USFWS 2009, p.78).

Effects of Dispersal Habitat Removed to Known NSO Sites

Removal of dispersal habitat *may affect, but is not likely to adversely affect* (direct and indirect), spotted owls (unless it is within the nest patch of a known or predicted owl site) because, even though dispersal habitat would be eliminated on these acres, sufficient habitat would remain in the area to facilitate owl dispersal which is the case for all proposed Goose project units (USFWS 2009).

There are nine units within the Goose project that would remove 371 acres of dispersal habitat to a post-harvest canopy closure of 30 percent for the purpose of enhancing big game forage. These are fast growing stands and are expected to increase in canopy closure by about 2 percent per year, achieving dispersal habitat again in 5-6 years after harvest. These nine units are: 60, 70, 620, 640, 650, 710, 750, 760, and 770. They fall within MSNO 0835, MSNO 0836, MSNO 2034, MSNO 2825, and MSNO 2836.

Effects of Harvest Habitat Downgraded to Known NSO Sites

Harvest Habitat Downgrade in suitable habitat *may affect, and is likely to adversely affect*, the spotted owl because such thinning would modify northern spotted owl suitable habitat to the extent that it no longer serves the function of nesting, roosting and foraging. It may, however, continue to function as dispersal habitat (USFWS 2009).

There are nine units within the Goose project that would downgrade 331 acres of suitable habitat to a post-harvest canopy closure of 40 percent. These units are: 300, 320, 330, 380, 450, 470, 480, 680, and 690. These units fall within five owl home ranges: MSNO 0835, MSNO 2034, MSNO 2035, MSNO 2825, and MSNO 3963. MSNO 0835 and MSNO 2034 are deficient in suitable habitat within their home ranges:

Effects of Harvest Habitat Maintained to Known NSO Sites

Harvest Habitat Maintained *may affect but is not likely to adversely affect* the spotted owl both directly and indirectly because current spotted owl habitat would be maintained. In the Biological Assessment for the Goose project, only dispersal habitat would be treated under this activity (USFWS 2009).

1351 acres of a dispersal harvest habitat maintained treatment is proposed, that would result in a post-harvest canopy closure of at least 40 percent. Table 34 displays known sites that have home ranges that overlap these treatment units. There are no predicted sites in the Goose project. However, no dispersal habitat would be reduced with the “harvest habitat “maintained treatments. These treatments in dispersal habitat stands are *may affect but are not likely to adversely affect* spotted owls (USFWS 2009).

Effects of Underburn to Known NSO Sites

Underburning *may affect and is likely to adversely affect* spotted owls both directly and indirectly since suitable habitat is expected to be downgraded to dispersal habitat. In dispersal, underburning *may affect but is not likely to adversely affect* (direct) spotted owls because although dispersal habitat may be removed, dispersal is not limiting in the area (USFWS 2009).

Three underburn units are proposed in the Goose project. The intent of these treatments is to return fire to the ecosystem. Units 800, 810, and 820 totaling 75 acres are currently functioning as suitable spotted owl habitat. The return of fire to these stands is expected to downgrade the habitat to a 40 percent canopy closure and thus a dispersal habitat function. These underburn units are within the home range of MSNO 2034 and MSNO 2838.

Effects of WUI Fuels Treatment to Known NSO Sites

WUI Fuels Treatments occur in the Wildland-Urban Interface (WUI) in order reduce the susceptibility of human built structures to wildfires by creating a defensible space in the WUI. This treatment proposes to reduce the vertical and horizontal continuity of fuels by either chipping or pile burning. This treatment is not expected to change the functionality of the current spotted owl habitat. Since habitat functionality remains the same, this treatment *may affect but is not likely to adversely affect* spotted owls directly nor indirectly.

The following Goose units or portions of: 840, 870, 880, 900, 920, 930, 940, 950, 960, 970, 980, 981, 990 are proposed for Wildland-Urban Interface (WUI) fuels treatments. The WUI fuels project is intended to reduce the vertical and horizontal continuity of fuels to create more defensible space near human built structures. A total of 447 acres of WUI Fuels treatments are proposed within suitable habitat. The removal of small diameter material less than 7" dbh for the chipping or burning is expected to maintain the functionality of the suitable habitat after treatment. In addition, the risk of fire ignition is reduced, and firefighter safety is increased by the creation of a defensible space in the WUI area.

The Goose WUI fuels reduction units are within the home ranges of MSNO 0835, MSNO 0836, MSNO 2417, MSNO 2825, and MSNO 2829.

Habitat Effects Summary Goose Project

A summary of the adverse actions anticipated by the Goose project due to habitat modification is shown in Table 36. A summary of northern spotted owl known sites adversely affected by habitat modification and associated activities which may result in harm to the northern spotted owl are listed in Table 37 below by known site number. Additional details about known owl sites and potential effects are located in Appendix F.

For the reasons discussed above and in USFWS et al. (2008), the habitat removal effects caused by these proposed actions are expected to harm three pairs of known spotted owls.

Table 36. Summary of Adverse Effects due to Spotted Owl Habitat Modification from the Goose Project

Project Name	Proposed Activity	Current Habitat Type	Post-treatment Habitat	LAA (Acres)
Goose	HH Remove	Suitable	non-habitat	78
	HH Downgrade	Suitable	dispersal	331
	Underburn	Suitable	dispersal	75
	Removal-Road	Suitable	non-habitat	2
Grand Total (acres)				486

(Willamette National Forest 2009,p.64).

Table 37. Summary of Northern Spotted Owl Site Effects from the Goose Project for Alternatives 2 and 3

NSO Site	Alternative 2 Adverse Effect?	Alternative 3 Effect
0835	Likely to adversely affect due to habitat modification (suitable and dispersal habitat removal)	Not likely to adversely affect due to habitat modification (dispersal habitat removed and downgraded)
2034	Habitat modification (suitable habitat downgrade and removal of 2 acres for road) & disruption	Not likely to adversely affect due to habitat modification (dispersal habitat removed and downgraded)
2836	Habitat modification (suitable habitat downgrade by underburning and dispersal habitat removal)	Not likely to adversely affect due to habitat modification (dispersal habitat removed and downgraded)

Alternative 3

The effects of Alternative 3 on spotted owl sites are less than those of Alternative 2 (Table 37). Effects to the three individual owl sites that have adverse effects under Alternative 2 are discussed below. Thinning less dispersal habitat with Alternative 3 would continue to provide more dense habitat for flying squirrels. These stands would continue to grow slowly and not show improved structural habitat conditions for many more decades. Snag and large down wood habitat conditions would not be improved.

MSNO 0835: Alternative 3 would not harvest unit 600 (dispersal habitat) within the 0.5 mile core of this owl site. In addition, units 590, 620, 630, and 691 are not harvested within the 1.2 mile home range compared to Alternative 2. All of these units consist of dispersal habitat with the exception of unit 691 which has about 12 acres of suitable owl habitat. Alternative 3 would include the same WUI fuels treatment within 28 acres of suitable habitat within the home range. After treatment, this known site would remain below optimal levels of suitable in both its core area and home range. The proposed WUI fuels treatment of 28 acres of suitable habitat *may affect but is not likely to adversely affect* northern spotted owls since habitat functionality would not change after treatment.

MSNO 2034: The main difference to this owl site between Alternative 2 and Alternative 3 is that it Alternative 3 would not include the 392 acre unit 10 (dispersal habitat) nor the 2-acre new road that would need to be constructed to access this unit. Effects to this owl site would be reduced compared to Alternative 2. In addition, Alternative 3 does not harvest an additional 217 acres of dispersal habitat within the home range of this pair. Alternative 3 would also not include 60 acres of prescribed underburning within the home range of this owl site. The above activities *may affect but are not likely to adversely affect the northern spotted owl.*

MSNO 2836: The main difference to this owl site between Alternative 2 and Alternative 3 is that it Alternative 3 would not include the approximately 200 acres of unit 10 that are within the 1.2 mile home range of this unit, nor would it include the 2-acre new road that would need to be constructed to access unit 10. Effects to this owl site would be reduced compared to Alternative 2. In addition, Alternative 3 does not harvest unit 30 (22 acres of dispersal habitat) within the home range of this pair. Finally, Alternative 3 would not include the underburning of unit 800 which is within the owl site’s 1.2 mile home range. The above activities *may affect but are not likely to adversely affect the northern spotted owl.*

Cumulative Effects

Alternative 1 – No Action

Since there would be no effects with Alternative 1, there are no cumulative effects to consider.

Alternative 2 and 3

Cumulative effects of other habitat modification activities within the 0.5 mile core area and 1.2 mile home range areas of the individual owl sites discussed above were considered in the current NSO habitat analysis displayed in Table 33. Considering direct, indirect, and cumulative effects, Alternative 2 may affect and is likely to adversely affect spotted owls. Alternative 3 may affect but is not likely to adversely affect spotted owls. Both Alternatives 2 and 3 would not jeopardize the continued existence of the spotted owl, nor would they preclude meeting recovery goals for spotted owls. The landscape would still support nesting spotted owls and dispersal post-treatment.

Disruption

When logistically feasible, proposed activities are modified to avoid disrupting spotted owls. Activities may be moved beyond the disruption distance of known nest sites or predicted nest patches, conducted outside the disruption period or implemented during years when survey protocol determines that nest sites are unoccupied (USFWS 2012b).

Direct and Indirect Effects

Alternative 1

There would be no disruption effects to spotted owls with Alternative 1.

Alternative 2

The Goose project may use a Type 1 helicopter to log unit 10 during the early nesting season due to scheduling difficulties for helicopters and economics. Because unit 10 is located near a historic owl site, this potential use of a helicopter was consulted on (USFWS 2012a). A summary of the USFWS consultation is shown in Table 38 which displays the helicopter unit, and owl site that may be affected by noise disturbance during the nesting season. One owl site is within 440 yards, and use of a helicopter during the critical nesting season *may affect, and is likely to adversely affect* (LAA) this owl pair if they are nesting due to noise disturbance.

Table 38. Northern Spotted Owl Sites that may be Adversely Affected (harmed) Due to Disruption with the Goose Project

NSO Site Number	Unit Number	**Number of breeding seasons** during which disruption may occur (including post-harvest activities).	Source of Disruption	Acres associated with disruption
2034	10	2	Helicopter Type 1 Post harvest pile burning	5

(Willamette National Forest 2009, p.35)

Note: The source of disruption should also have included prescribed underburning.

The Design Features in Chapter 2 display recommended seasonal restrictions for spotted owls during the critical nesting season. It should be noted that the seasonal restriction for unit 10 is a recommendation, not a requirement. In many such cases when helicopters are used, it is difficult to schedule them around seasonal restrictions. Annual project monitoring reports would track the actual effects and report these back to the U.S. Fish and Wildlife Service. This project may cause disruption (harm) to one known owl sites for two seasons due to helicopter noise and post-harvest pile burning during the nesting season. However, it should be noted that site 2034 is annually surveyed by the Oregon Cooperative Wildlife Research Unit, and has not been found nesting since 2004, so the chances of successful nesting in the projected two years of operation are quite low.

Alternative 3

Alternative 3 would not harvest unit 10, thus, there would be no noise disturbance effects to the northern spotted owl.

Alternative 3 would have similar effects on forest structure and response as described in Alternative 2 for similar treatments. Alternative 3 does not include any suitable spotted owl habitat treatments, thus, the effects of this alternative on spotted owls are less than those of Alternative 2. Table 39 below shows the number of acres proposed for treatment by spotted owl habitat type.

Table 39. Treated Acres by Spotted Owl Habitat Type – Alternative 3

Spotted Owl Habitat Type(s)	Suitable	Dispersal	Non-habitat
Treated Acres	0 acres	660 acres	85 acres

Cumulative Effects

Alternative 1 – No Action

Since Alternative 1 would have not cause any noise disturbance effects to spotted owls, there are no cumulative effects to be considered.

Alternative 2

The only other currently ongoing project in the project area is the Eagle Timber Sale Project which would remove about 176 acres of spotted owl dispersal habitat, but had no noise disturbance effects to the northern spotted owl. There are no other reasonably foreseeable actions in the project area that would cause noise disturbance at this time.

Other past projects that have affected the northern spotted owl and its' habitat in the project area include the removal of approximately 764 acres of suitable owl habitat, and thinning of approximately 336 acres of dispersal habitat (Appendix D), all of which used seasonal restrictions as needed to prevent noise disturbance to known spotted owl activity centers during the critical breeding season between March 1-July 15. None of the other currently ongoing or past projects caused noise disturbance effects to known northern spotted owl activity centers during the critical breeding season. In considering direct, indirect, and cumulative effects, noise disturbance from the Goose project may affect and is likely to adversely affect northern spotted owls, but would not jeopardize the continued existence of the spotted owl.

Alternative 3

Since Alternative 3 would have not cause any noise disturbance effects to known spotted owl sites, there are no cumulative effects to be considered.

3.5.9 Affected Environment – Proposed Threatened and Forest Service Sensitive Wildlife

Sensitive species are species that are not federally listed under the Endangered Species Act, but that are designated by the Forest Service and given special consideration in project analysis due to viability concerns. The goal of the Forest Service is to manage for these species so that they will not become federally threatened or endangered. Effects of the alternatives on Forest Service sensitive species are considered in a project Wildlife Biological Evaluation (BE). This environmental impact statement tiers to the analysis in the BE and provides a summary of the effects in Table 40. One proposed threatened, and six sensitive species have habitat or potential suitable habitat in the project area and were analyzed in detail in the project BE. One of these species, the Crater Lake tightcoil, is on both the “Sensitive” species list and the “Survey and Manage” species list; therefore discussions of effects on this species will be limited to the table below and the Survey and Manage species discussion section.

Fisher

It is unlikely that fishers occur in the project area. While there have been three Fisher sightings on the McKenzie River Ranger District (Forest Service NRIS database), none of these have been verified with a photo or DNA. The last verified records of fishers on the Willamette National Forest were in the 1940s with the exception of a 2014 detection at the very south end of the Forest. This individual fisher may only be from a dispersing male from the recent fisher reintroduction at Crater Lake. Currently USFWS has not designated proposed critical habitat for the fisher in any portion of its range.

American Peregrine Falcon

Preferred nesting sites for peregrines are sheer cliffs 75 feet or more in height having horizontal ledges or small caves. Foraging is associated with a variety of open and forested habitats, however it is most closely associated with riparian settings. Numerous potential nest sites and occupied territories occur on the Willamette National Forest.

Townsend’s Big-Eared and Fringed Myotis Bats

These two bat species are known to roost in tree and snag cavities and under loose bark (Lacki et al. 2007). On the west side of the Cascades, snags are thought to be the main roosting habitat for fringed myotis and a minor roosting component for Townsend’s big-eared bats (Ormsbee personal communication). No tree/snag roost sites have been documented by the Forest Service in the project area or on the Forest, but such sites are very difficult to detect.

Johnson’s Hairstreak Butterfly

Peak conditions for the Johnson’s hairstreak butterfly exist in old-growth and late successional forests. Younger forests that contain dwarf mistletoe may also have the potential to support populations. No dwarf mistletoe was seen during field reviews of the proposed Goose units in 2009. Currently there are about 10,037 acres of potential habitat for the butterfly species in the project area (or 56 percent), and 404,500 acres of potential habitat on the Willamette National Forest (22.5 percent of total forest acres).

Cascade Axetail Slug

The Cascade axetail slug (*Carinacauda stormi*) is a recently described genus and species that is endemic to the northern west side of the Oregon Cascade Range (Leonard et al. 2011). It occurs within a restricted range that includes portions of the Mt Hood National Forest, Salem BLM, and the Willamette National Forest (Burke 2013, Young and Doerr 2011). The slug is associated with needle litter duff in Douglas-fir/western hemlock forests with a vine maple understory, which is a wide-spread habitat type on the Forest. The slugs have been found in forests ranging in age from about 30 years to old-growth (Young et al. 2010). Although it has a regionally restricted range, it appears to be relatively common within its range on the Willamette National Forest (Doerr and Young 2009, Young et al. 2010). Only a very small percent of the slug habitat, on the Forest and within the project area, has been surveyed to date. Regardless of this fact, the species has been detected at 394 sites on the Forest. This detection rate indicates that there are thousands of sites on the Forest where this species occurs. Strategic surveys have been conducted for this species, and the nearest known location to the Goose project area is about 1 mile to the south in the lower Horse Creek watershed. Four individual Cascade Axetail Slugs were found at this site in 2010 (U.S. Forest Service 2014, NRIS database accessed 10/21/2014). Additional locations are to the west and south in the South Fork McKenzie River watershed, and many locations to the north in the Blue River Watershed. There are no known locations to the east of the project area or in the entire Headwater McKenzie River Watershed.

3.5.10 Environmental Consequences - Proposed Threatened and Forest Service Sensitive Wildlife

All Proposed Threatened and Forest Service Sensitive Wildlife

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would have no impact on any sensitive or proposed threatened species. Stands under 40 years old would develop diverse structure more gradually compared to thinning them now. Snag and down wood development would occur naturally over time, primarily within the next 20-40 years as the stands thin themselves, benefitting habitat for the Fringed Myotis and Townsend’s Big-eared bat. Stands between 40-80 years old would continue to grow larger tree diameters. As these stands continue to thin themselves out, the small openings would begin to show more understory forbs, shrubs, and second layer of conifers, moving these stands towards late-successional habitat which would benefit fishers and bats. The older stands in the Goose area would continue to develop towards old-growth, which should improve future habitat for Johnson’s hairstreak, fringed myotis, and Townsend’s big-eared bats. Potential habitat for the fisher would also improve over time in these stands.

Fisher

Direct and Indirect Effects

Alternative 2

Because only one fisher location is currently known on the Willamette National Forest, and it is unlikely that this species would occur in the project area, this project is judged to pose a No Effect to fisher. Alternative 2 may adversely impact potential fisher habitat due to older forest habitat modification, but is not likely to jeopardize the continued existence of the species. Alternative 2 of the Goose Timber sale units includes 426 acres of stands over 80 years old, some of which are up to 122 years old. The older stands contain higher quality potential habitat for this species. Regeneration harvest proposed in Alternative 2 would degrade potential fisher habitat by reducing future snag and downed wood sources and by reducing forest canopy that could aid in thermoregulation (Hayes and Lewis 2006, p. 13). However, some forest structure of value to fishers would remain with the overstory tree retention that would be left and with the snags and downed wood that would be created and enhanced. Unit harvests would leave most of the largest overstory trees, however, depending on tree spacing, they may not always be retained. Alternative 2 would impact less than 5 percent of 2 hypothetical female fisher home ranges based on where units over 80 years of age are clustered. Less than 2 percent of 2 hypothetical male fisher home ranges may be impacted.

Alternative 2 also proposes 60 acres of natural fuels underburn. While the burn itself may result in the habitat becoming less suitable if down wood is burned, some would remain unburned, and in the longer term (>50 years), the additional dead wood that could be created from the underburning may benefit fisher. Both Alternatives 2 and 3 would include about 325 acres of hazardous fuels treatments in older stands which may reduce fisher habitat quality by reducing hiding cover. However, those treatments would take place in the Wildland-Urban Interface which is generally less secluded and is not likely to provide potential habitat for the fisher.

The management recommendation to leave and/or create large down wood may ensure habitat requirements of this species are met. The planned downed wood enhancement within 505 acres of spotted owl Critical Habitat with Alternative 2, and 63 acres with Alternative 3 would provide long-term (>50 years) potential future habitat benefits. Additional down wood habitat enhancement within the other units as recommended in the design features (Chapter 2) would also provide benefits.

Conferencing of the proposed action (Alternative 2) is only required if the action is likely to jeopardize the species. However, if the fisher is listed, the Forest Service may need to consult with the U.S. Fish and Wildlife Service on the effects of the Goose project on this species. If there is a final listing determination, it should clarify what portion of the historic range would require consultation.

Alternative 3

Alternative 3 would not impact any stands over 80 years of age, and thus would be unlikely to have an impact on potential fisher habitat. Thinning of the younger stands with subsequent down wood creation in Alternatives 2 and 3 may improve down wood habitat conditions and may thus provide a minor benefit to Fishers, if they occur in the area.

Alternatives 2 and 3 would retain sufficient habitat to provide for fishers should they reestablish in the area in the future.

Cumulative Effects

Alternative 2 and 3

Other past projects that have modified potential fisher habitat in the project area include the removal of approximately 764 acres of high quality mature forest habitat, and thinning of approximately 336 acres of lower quality second growth plantations (Appendix D). The Pass Thin Project is currently in the planning stages and would thin approximately 21 acres of younger and lower quality potential fisher. Ongoing maintenance of the powerline that crosses the project area also permanently removes approximately eight miles or 151 acres of future potential fisher habitat. Sixth field watersheds to the west, east and south of the project area have similar levels of potential fisher habitat fragmentation and similar habitat quality. The Lookout sixth field watershed to the north has lower levels of potential fisher habitat fragmentation and higher habitat quality based on fragmentation and the amount of mature and old-growth forest habitat. Considering the Goose project as well as past, present, and reasonably certain future projects, approximately 53 percent of the project area would remain in forest habitat greater than 80 years of age, which should provide for the potential habitat needs of the fisher.

American Peregrine Falcon

Direct and Indirect Effects

Alternative 2 and 3

There would be no measurable effect impact on this species. Logging would result in slightly different prey and availability of prey in and around the units, but the overall prey base for peregrine falcons is not expected to decline. With the implementation of seasonal restrictions as recommended in the BE, there would be no impact to peregrine falcons from either Alternative 2 or 3. The proposed logging and other activities occur outside a peregrine primary and secondary zone, however some proposed units do occur within the tertiary zone. The use of helicopters is judged to have a higher degree of disturbance to nesting peregrine falcons than ground-based operations. While some of the proposed Goose Alternative 2 units that would use helicopters do overlap the tertiary zone, they are located on the outer perimeter of the 3-mile radius. All proposed activities would occur at a sufficient distance from nesting habitat such that any disturbance potential would be avoided (Pagel 1992).

There would be no effect to peregrine falcons from the other activities proposed with Alternatives 2 and 3 which include harvest, hazardous fuels reduction, prescribed underburning, road maintenance, or temporary road construction.

Cumulative Effects

Alternative 2 and 3

Other past and ongoing projects (Appendix D) have altered forest structure and composition in the Goose project area, which has altered the species composition and availability of peregrine prey. The cumulative effects of these projects, combined with effects from the Goose project, would still provide for the foraging needs of peregrine falcons.

Townsend's Big-Eared and Fringed Myotis Bats

Direct and Indirect Effects

Alternative 2 and 3

Alternatives 2 and 3 would create 324 and 111 acres, respectively, of open forested habitat with some larger trees and snags (gaps and regeneration harvest acres). An additional 1,218 and 469 acres would be thinned with Alternatives 2 and 3, respectively (harvest acres excluding skips). The site-specific effect of this change to bat foraging habitat is uncertain, and could range from adverse to beneficial. The magnitude of the effects on foraging habitat at the landscape and forest level scales are minimal, however, because Alternatives 2 and 3 harvest acres affect 9 and 3 percent of the project area, respectively, and less than 0.01 percent of the Willamette National Forest. Hazardous fuels treatments would not impact bat habitat.

The Goose units contain some large snags and decadent features that might provide potential tree roost sites for bats, but at a lower abundance than would be found in old-growth forests. Proposed timber harvest in the stands over 80 years of age in Alternative 2 would retain some of the larger trees and a few large snags, but the harvest and possible subsequent underburns would largely degrade bat roosting tree habitat on about 424 acres. These are the unit footprint acres and some additional snags in adjacent skips or outside unit boundaries may be lost if they are safety hazards in the logging or underburn operation. Prescribed underburning may create additional snags that might be used by bats after 10 or more years. In addition, snag creation is planned for the 43 acres of proposed regen stands in Alternative 2 (Units 471, 691, and 720), and is recommended for the thinning stands at the rate of 1-4/acre.

Cumulative Effects

Alternative 2 and 3

The evaluation above incorporates past Forest Service activities in the project area in the analysis of the current condition (e.g. estimate of potential bat roosting habitat available accounts for past timber harvest) and assumed all of the younger stands are unsuitable for bat tree roosting. The only other currently ongoing activity in the project area that could result in impacts to bat habitat is the Eagle Timber Sale which would log about 54 acres in stands with trees over 18" in diameter. Together with the proposed Goose project, Alternative 2 would result in impacts to 480 acres of older forests or approximately three percent of the project area. Viability would still be maintained throughout the project area, and the Goose project would not cause a trend toward federal listing.

Johnson's Hairstreak Butterfly

Direct and Indirect Effects

Alternative 2

The 424 harvest acres and 2 acres of road construction in stands over 80 years in Alternative 2 are potential habitat for this species. In addition, potential habitat exists in the proposed prescribed underburning stands (units 800, 810, and 820=60 acres), as well as the hazardous fuels reduction units (850, 860, 870, 900, 930, 940, 950, 960, 980, and 990=325 acres). No dwarf mistletoe was located during stand exams (Rudisill pers. comm.), nor was any detected during field surveys. The habitat in the harvest units is currently considered low-quality for the Johnson's hairstreak. As the Goose stands age, however, western hemlock would become more dominant and the possibility of dwarf mistletoe establishment should increase.

The 43 acres of regeneration harvest with leave trees (Units 471, 691, and 720) proposed in Action Alternative 2 would adversely impact potential habitat for Johnson's hairstreak by removing understory and overstory trees. Immediately following logging, fewer hemlock trees would remain so there would be fewer sites where dwarf mistletoe could establish. Also, mistletoe spreads more rapidly in multistoried stands since the understory trees are showered by mistletoe seeds from plants in the overstory (USDA Forest Service Pacific Northwest Region). The regeneration harvest would remove the various levels of canopies that currently exist in the stand. However, western hemlock would readily regenerate in the understory following treatment. By 80 years post-treatment and continuing as the stands age, it is expected that there would be a large component of western hemlock that would be suitable for dwarf mistletoe establishment and thus potential habitat for the Johnson's hairstreak.

About 381 acres over 80 years of age would be thinned with Alternative 2, which would have a smaller effect to potential Johnson's hairstreak habitat than the 43 acres of regeneration harvest, because the thinning prescription is designed to retain the largest overstory trees in most cases. In the future, these largest stand trees could develop dwarf mistletoe which may become Johnson's hairstreak habitat.

Thus, Alternative 2 would impact potential Johnson's hairstreak butterfly habitat on 424 acres for about 80 years. An additional 2 acres of forest stands over 80 years of age would be removed for a temporary road to access unit 10, and may have some understory tree regeneration, yet the compacted road may slow tree growth. An evaluation of stands greater than 80 years of age in the project area shows that about 56 percent is potential habitat for the Johnson's Hairstreak.

Alternative 2 would impact approximately five percent and approximately 0.1 percent of the estimated potential Johnson's hairstreak habitat in the project area with harvest activities, and on the Willamette National Forest, respectively. This includes both harvest activities (424 acres) as well as the prescribed natural fuels underburn (60 acres), totaling 484 acres.

Alternative 3

Alternative 3 would not impact Johnson's Hairstreak habitat because all stands to be harvested would be under 80 years of age and the natural fuels underburn is not included, and thus the impacts would not be measurable because the chances of the younger stands having any dwarf mistletoe are very low. Some individual trees containing dwarf mistletoe may be felled if there are hazard trees along the haul route.

Cumulative Effects

Alternative 2 and 3

The other reasonably foreseeable harvest activity in the watershed that would affect some older trees is the Eagle Timber Sale which would log about 54 acres in stands over 18” diameter. Because the majority of the potential habitat would be unaffected by activities, Johnson’s hairstreak viability is expected to be maintained at the 6th field watershed level and within the broader project area for both action alternatives, considering direct, indirect, and cumulative effects. Because viability would be maintained at the watershed level, the proposed actions are not expected to affect viability at the larger Forest scale, nor cause a trend toward federal listing.

Cascade Axetail Slug

Direct and Indirect Effects

Alternative 2 and 3

With Alternatives 2 and 3, impacts, if any, are expected to be minor due to the apparently wide range of habitat types this species may use and the relatively small size of this project within the larger Upper McKenzie River Watershed. Species viability on a large scale would continue to persist. It is unknown if localized populations may be temporarily impacted due to ground disturbance.

Regeneration harvest, underburning, prescribed natural fire, and hazardous fuels treatments in Alternative 2 would degrade habitat for Cascade Axetail Slugs and may result in loss of the species at those sites, although one individual was found at a site that recently burned, indicating an ability to persist after low severity fires (Doerr and Young 2009). The species has been found in Douglas fir-western hemlock forests with a vine maple understory which is a common habitat type on the Willamette National Forest. Only a very small amount of the suitable Cascades Axetail Slug habitat on the forest has been surveyed to date, and the species has been detected at 394 sites on the Forest. This detection rate indicates that there are thousands of sites on the Forest where this species occurs.

Commercial thinning in Alternatives 2 and 3 may degrade habitat for Cascades Axetail Slugs, but is not expected to result in loss of the species at the stand level because the species occurs in a wide range of forest age classes and thinning would retain some overhead forest canopy, leaf litter, and existing understory plant species. Because thinning could increase vine maple understory abundance, it could have potential benefits to slug habitat although this has not been studied. The large down wood enhancement work being recommended for many of the thinning units may also benefit Cascades Axetail Slug habitat by providing additional ground hiding cover that retains needed moisture. The proposed Goose Action Alternatives would not impact any known documented site for Cascades Axetail Slugs.

Because the direct, indirect, and cumulative effects of the Action Alternatives would impact only a small percentage of the Cascades Axetail Slugs that occur in the project area, Alternatives 2 and 3 may adversely impact individuals, but would not likely result in a loss of viability in the Planning Area, nor cause a trend towards federal listing.

Cumulative Effects

Alternative 2 and 3

One other ongoing project, the Eagle Timber Sale, would thin about 176 acres in suitable Cascades Axetail habitat. The planned Pass Thin Project would thin an additional 21 acres that may impact this species. While impacts to the Cascades Axetail Slug cannot be excluded, they are expected to be very minor and cannot be measured. Some impacts could occur from ground disturbance. There are other actions in the project area that may add to, but are not expected to impact or add towards cumulative effects on the slug species (see Appendix D).

Table 40 provides a summary of effects for Alternatives 2 and 3 for Proposed Threatened and Sensitive Species which occur or have potential habitat in the project area.

Table 40. Summary of Effects of Alternatives 2 and 3 for Proposed Threatened and Sensitive Species

Species	Effect Determination For Alts. 2 and 3*	Rationale For Determination
Fisher	No short-term effect with potential long-term (>10 years) beneficial impact	Fishers are unlikely to occur in the project area and the scale of the alternatives, which would impact between <5 percent of 2 hypothetical female home ranges, would not preclude them from reestablishing in the watershed, and effects to this species are unlikely to occur. Potential denning habitat would be retained in all hypothetical home ranges. In the long-term over 10 years, potential Fisher habitat quality may benefit from underburning and large down wood enhancement.
American Peregrine Falcon	No Impact	No activities planned in primary or secondary home range, on very outer perimeter of tertiary home range and not judged to pose an impact. Proposed harvest treatments would be neutral to falcon foraging habitat.
Fringed Myotis (bat) and Townsend's Big-eared Bats	MAII**	Effects on foraging habitat and potential tree roosting and natal habitat is minor at the project area, watershed and Forest scale. Probablility that an occupied roost or natal site would be fallen during logging or hazard tree felling operations is low.
Johnson's Hairstreak (butterfly)	MAII**	Only a very small amount of western hemlock habitat would be affected by project activities and the Goose Units currently have no identified dwarf mistletoe, which hosts larval stage.
Crater Lake Tightcoil	MAII**	Survey data has only detected this species at a single location on the Willamette National Forest and streamside buffers would exceed the recommended 10 meters in suitable habitat..
Cascades Axetail Slug	MAII**	Survey data indicates that this endemic species is relatively abundant within its' restricted range. Proposed activities, plus other past, present, and reasonably forseeable actions, would impact only a small portion of the known and likely occupied sites in the project area, watershed and on the Forest.
*Alternative 1 would have No Impact on any Sensitive Species. **MAII: May Adversely Impact Individuals, but would not result in a loss of viability in the Planning Area, nor cause a trend towards federal listing. See project Biological Evaluation for a more detailed analysis.		

3.5.11 Affected Environment – Survey and Manage Species

The Northwest Forest Plan was amended with standards and guidelines for conducting project surveys and managing known sites for certain rare or endemic species that were associated with late successional forest habitat (Forest Service and BLM 2001). Species covered by this direction are referred to here as "Survey and Manage" species. There are four wildlife Survey and Manage species on the Willamette National Forest: Crater Lake tightcoil snail, Oregon Megomphix snail, red tree vole, and great gray owl.

Oregon Megomphix

This snail occurs at low to moderate elevations, below the zone of seasonally persistent snow pack. Megomphix snails are most often found within the mat of decaying vegetation under sword ferns and big-leaf maple trees and near rotten logs. Most occupied sites are on well-shaded slopes and terraces, and many are near streams (Management Recommendations for Terrestrial Mollusk Species: *Megomphix hemphilli*, the Oregon Megomphix, Version 2.0, Applegarth 2000). Oregon Megomphix is in S&M Category "A" in Linn County and this project is in Lane County, so surveys are not required, however the guidelines do require management of known sites as of 9/30/99. There are no records of the Oregon Megomphix in the project area. In western Oregon most Megomphix locations are between 500-1500 feet, with 2540 feet being the highest elevation at which this species has been found (Forest Service and BLM 1999), however there has been a location found at about 3000' elevation on the McKenzie River Ranger District and thus, this elevation is being used as the Megomphix habitat upper elevation level for the habitat analysis.

Red Tree Vole

Project surveys for the red tree vole were conducted in 2009 and 2015 all proposed Alternative 2 stands over 80 years of age as required by the Red Tree Vole Survey Protocol Version 3.0 (Forest Service and BLM 2012). No red tree vole nests were found. Project surveys were not required in stands to be thinned under 80 years of age for Survey and Manage wildlife species due to exemptions "A", under what is commonly known as the "Pechman exemption(s)."

These standards and guidelines to conduct red tree vole surveys and protect nest sites were developed, along with other habitat protection measures from the Northwest Forest Plan, to provide a reasonable assurance of persistence of certain species, such as red tree vole, which were believed to be rare and uncommon across the range of the Northwest Forest Plan at the time it was developed. For vertebrate species, like voles, this persistence objective is consistent with the goals of providing for viable and well-distributed populations under the National Forest Management Act Regulations (Forest Service and BLM 2001:3-4; Forest Service and BLM 1994:43-47).

Great Gray Owl

Individual great gray owls can be found in a wide variety of habitat types. However, forests appear to be necessary for reproduction in North America (Habeck 1994, Duncan and Hayward 1994). Examples of forest types known to be suitable for great gray owls include: ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), tamarack (*Larix occidentalis*), Douglas-fir (*Pseudotsuga menziesii),* grand fir (*Abies grandis*), mixed conifer- hardwood, aspen (*Populus tremuloidus*), and other deciduous tree types. Platt and Goggins (1991) found great gray owl nests on the Willamette National Forest in mature and remnant old-growth Douglas-fir and mixed-conifer habitat. Most nests are located near natural meadows or manmade openings. Bryan and Forsman (1987) found nests in south central Oregon to be less than 980 feet (300m) from the nearest meadow opening. Platt and Goggins (1991) found nests within 660 feet (200m) of a timber-harvest-created opening.

In some locations like on the Willamette National Forest, shelterwood harvesting has been found to be beneficial because it opens up closed forest canopy cover for foraging (Forest Service and Bureau of Land Management 2001). Pre-disturbance survey(s) for Great Gray Owls are not required because the proposed harvest units in Alternatives 2 and 3 do not have proximity to natural openings > 10 acres, and pre-disturbance surveys are not required in suitable nesting habitat adjacent to man-made openings at this time (pg. 14, Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004). The required habitat characteristics of suitable Great Gray Owl habitat include: (1) large diameter nest trees, (2) forest for roosting cover, and (3) proximity [within 600 feet] to openings that could be used as foraging areas (Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004).

NRIS, the Forest Service web-based wildlife sighting database, currently shows four records of Great Gray Owls in the project area. While Great Gray Owl surveys have not been systematically conducted in the project area, an area including and around the lower Foley Seed Orchard is suspected of being used as a nesting territory since the 1990s. Protocol surveys have not been conducted since the 1990s, but Great Gray Owls have been seen in or near the lower Foley Seed Orchard on multiple occasions since then through 2014. The other historic Great Gray Owl sightings in the project area are in the eastern portion, and not near any proposed units. With the exception of the lower Foley Seed Orchard which is a very open tree plantation with wide spacing and a grassy understory, much of the historic foraging habitat in the project area that existed in the 1990s has now grown into dense stands that are no longer suitable for foraging. The suspected nest location is within disturbance distance of some of the Goose Alternative 2 and 3 units.

Crater Lake Tightcoil Snail

This species is associated with areas within 10 meters of perennial wetlands and riparian areas (Duncan et al. 2003).

Mollusk surveys were not required for the Goose project because all suitable habitat for Crater Lake Tightcoil would be protected with a minimum of a 10m (30 feet) no-harvest buffer. There would be no active fire ignitions within this buffer area.

3.5.12 Environmental Consequences – Survey and Manage Species

All Survey and Manage Species

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would have no effect on the Oregon Megomphix snail, red tree vole, great gray owl, or Crater Lake Tightcoil snail.

Cumulative Effects

Alternative 1 – No Action

Since Alternative 1 would have no effect on the Oregon Megomphix snail, red tree vole, great gray owl, or Crater Lake Tightcoil snail, there are no cumulative effects to be considered.

Oregon Megomphix

Direct and Indirect Effects

Alternative 2 and 3

Alternative 2 may impact suitable Oregon Megomphix habitat at low and moderate elevations below 3000’ on about 2,409 acres, which is about 17 percent of the suitable habitat in the project area (about

13,925 acres below 3000’). The impacts of Alternative 3 on Megomphix habitat are somewhat less than Alternative 2, impacting about 1,069 acres of suitable habitat. This is about 8 percent of the suitable Megomphix snail habitat in the project area.

Cumulative Effects

Alternative 2 and 3

While this project may impact individual Megomphix snails, it is not expected to result in any issues for population viability of this species. The NRIS database accessed on August 6, 2014 shows over 163 records of the Oregon Megomphix on the Willamette National Forest. These were detected with limited survey work over several years, and this number is likely only a very small percentage of all the Megomphix locations on the Forest. Impacts to individuals may occur, but overall population viability would not be impacted. Effects to Megomphix from any other actions proposed in the Goose project do not overlap in time and space with effects from any past, present or reasonably foreseeable future actions; therefore, the Goose project has no further cumulative effects on the Oregon Megomphix.

Red Tree Vole

Direct and Indirect Effects

Alternative 2

Alternative 2 would remove or thin approximately 424 (footprint acres with skips included), of red tree vole habitat in stands over 80 years of age, but would not affect any documented red tree vole nest areas.

Suitable spotted owl habitat can be used to estimate the amount of higher quality red tree vole habitat. There are currently about 7,337 acres of higher quality red tree vole habitat in the project area, and Alternative 2 would remove or thin about 6 percent. Because of the number of overstory trees that are being left, the harvest units would return to conditions matching the description of suitable red tree vole habitat (Forest Service and BLM 2012) in about 50-60 years. About 2,003 (footprint) acres of lower quality red tree vole habitat in stands under 80 years of age would also be impacted. While nests in younger stands are less likely to be present, they may still be present.

Alternative 3

Alternative 3 would only remove about 2 acres of stands over 80 years of age, which may be higher quality red tree vole habitat, due to the temporary road construction needed for access to unit 10. About 744 acres of lower quality red tree vole habitat in stands under 80 years of age would be downgraded from the harvest operation.

Both alternatives 2 and 3 would reduce red tree vole habitat quality with the hazardous fuels reduction activities on approximately 325 acres of stands over 80 years of age. Alternative 2 may also downgrade red tree vole habitat quality on 60 acres with natural fuels underburning in stands over 80 years of age. Because Alternatives 2 and 3 adhere to the 2001 Survey and Manage direction and protect all known red tree vole sites, and, cumulatively, only a very small amount of higher quality red tree habitat would be affected, both alternatives are expected to maintain red tree vole persistence and viability within the project area.

Cumulative Effects

Alternative 2 and 3

No red tree vole nests are currently known from the project area. Past timber sales that had completed red tree vole surveys include Nugget, Pebble, and Cup (under the Foley Ridge Landscape Management Project), and none were found. The recently completed Eagle Timber Sale was surveyed for red tree voles and none were found. Red tree voles either do not occur in the project area or are so rare they cannot be found. Considering the effects of all past, present and reasonably foreseeable future actions on red tree voles in the project area, there are no concerns for future red tree vole persistence or population viability.

Great Gray Owl

Direct and Indirect Effects

Alternative 2

Alternative 2 would create about 324 acres of open habitat (43 acres of regeneration harvest and 281 acres of gaps) which may enhance opportunities for great gray owl foraging. On the west slope of the Cascades, regeneration harvests initiate an early successional stage that can support small-mammal populations likely to be used by great gray owls up to about ten years post-harvest (Quintana-Coyer et al. 2004). Proposed unit 720 is a 90 year old, natural stand with some remnant overstory trees in close vicinity of the lower Foley Seed Orchard which is planned for a regeneration harvest. The prescription would leave a minimum of 15 percent canopy cover plus additional trees for snag creation. The largest overstory trees would be retained in most cases, which are the trees which could be used by Great Gray Owls for nesting. The stand has been designed around a small 13-acre patch of older forest which would not be harvested and contains Great Gray Owl nesting habitat, including large overstory trees with diverse structure and potential nesting platforms. Opening up unit 720 would supplement the currently existing foraging habitat in the Foley Seed Orchard. Thinning unit 740, which is directly adjacent to the seed orchard may also provide some additional lower quality foraging opportunities. Nesting habitat would be maintained, and foraging opportunities would improve.

The most critical time for disturbance to nesting Great Gray Owls is during egg-laying and incubation, which is generally March 15 - May 15, and thus a seasonal operating restriction is recommended for Alternative 2 units 720 and 740 to protect nesting birds and their young (See Table 13 Design Features). This seasonal operating restriction is centered around the area where Great Gray Owls were observed in the 1990s and continue to be observed once or more almost every year, during various times of the year. Great Gray Owls in the western Cascades Province generally nest in trees with a diameter breast height ranging from 38-42 inches that are within 220 meters/656 feet near open, grassy areas (Quintana-Coyer et al. 2004). With a seasonal restriction in place, any young of the year that may be present in the area during logging or burning operations would be mobile, and impacts would be short term and limited to possible displacement. Without a seasonal restriction, the adult owls could abandon a nest long enough to result in a nest failure for the year(s) of operation.

Alternative 3

Alternative 3 would create about 111 acres of open foraging habitat for Great Gray Owls with the proposed small gap treatments. Unit 720 would not be harvested in the Great Gray Owl use area and no additional high quality foraging habitat would be created. Thinning unit 740 would provide some additional lower quality foraging habitat opportunities. The lower Foley Seed Orchard would continue to provide foraging habitat opportunities. A seasonal restriction for unit 740 would adequately protect any nearby nesting Great Gray Owls and their young.

Cumulative Effects

Alternative 2 and 3

There have been about 764 acres of timber harvest between 1993 and 2014 in the project area. These recent harvests may have created some openings or thinned young stands which may benefit Great Gray Owl foraging habitat quality. The recently completed 13 Thin Timber may provide some additional small scale gap habitat useable by Great Gray Owls. The recently completed Eagle timber sale harvested about 176 acres and is unlikely to benefit Great Gray Owls because there have never been any observations in the western portion of the project area. Effects to Great Gray Owls from any other actions proposed in the Goose project do not overlap in time and space with effects from any past, present or reasonably foreseeable future actions; therefore, the Goose project has no further cumulative effects on Great Gray Owls.

Crater Lake Tightcoil Snail

Direct and Indirect Effects

Alternative 2 and 3

For all proposed units in both Alternatives 2 and 3, there would be no treatment within 10 meters of perennially wet areas, and there should be no impact on this mollusk. Protection buffers are being placed around perennial wetlands where they occur near or in the proposed harvest units, and prescribed fire treatments would not allow fire to be lit in 10m riparian buffer area following the management recommendations for this species and thus, no impacts to this species is expected (Forest Service and BLM, 1999).

With the above measures in place, overall population viability in the project area and on the Willamette National Forest would be maintained and the persistence of the species should not be compromised.

Cumulative Effects

Alternative 2 and 3

Effects to Crater Lake Tightcoil from actions proposed in the Goose project do not overlap in time and space with effects from any past, present or reasonably foreseeable future actions; therefore, the Goose project has no cumulative effects on Crater Lake Tightcoil.

3.5.13 Affected Environmental – Management Indicator Species

The use of Management Indicator Species (MIS) in project planning was established by the 1982 National Forest Management Act planning regulations. Management Indicator Species are species whose response to land management activities can be used to predict the likely response of a wide range of species with similar habitat requirements. The Final Environmental Impact Statement for the 1990 Willamette National Forest Land and Resource Management Plan identified MIS and the rationale for their selection (Forest Service 1990: III-69, Table 41). A requirement is that viable populations of MIS be maintained at the Forest Level. The effects of the alternatives on northern spotted owl are addressed above in a specific section for that species. The effects of the alternatives on peregrine falcons are also addressed above in the section on Forest Service Sensitive Species. The project Biological Evaluation concluded that the alternatives would have no impact on bald eagles because the alternatives do not affect lakes and fish streams. The effects of the alternatives on the remaining MIS are addressed below.

Table 41. Wildlife Management Indicator Species for the Willamette National Forest

Indicator Species	Indicator Habitat	Reason Selected in 1990
cavity excavators[1]	dead and decaying trees	ecological indicator, limited habitat
elk	winter range	commonly hunted
deer	winter range	commonly hunted
pileated woodpecker	old growth and mature conifers	ecological indicator, limited habitat
marten	old growth and mature conifers	ecological indicator, limited habitat
northern spotted owl[2]	old growth and mature conifers	ecological indicator, limited habitat, proposed threatened species[2]
bald eagle[3]	old growth conifers near large bodies of water	federally threatened species[3]
peregrine falcon[3]	cliff nesting habitat near abundant prey	federally endangered species[3]

[1]Forest Service (1990) identified the following species in this group: red-breasted nuthatch, northern flicker, hairy woodpecker, downy woodpecker, red-breasted sapsucker, Lewis woodpecker, black-backed woodpecker, and northern three-toed woodpecker.
[2]Became a federally threatened species in June 26, 1990, as the Willamette NF Plan was being finalized.
[3]Bald eagles and peregrine falcons were subsequently delisted and are now Forest Service Sensitive Species.

Cavity Excavators, Pileated Woodpecker, and Deadwood Abundance

Cavity excavator MIS are used as an ecological indicator for the abundance of dead and decaying trees. Pileated woodpeckers are MIS that use snags, but also prefer old and mature forests. Cavity excavator MIS species that occur or have potential habitat in the proposed Goose Units are red-breasted nuthatch, northern flicker, hairy woodpecker, downy woodpecker, red-breasted sapsucker, and pileated woodpecker. None of these species are federally listed Endangered or Threatened Species, Forest Service Sensitive species, U. S. Fish and Wildlife Service Birds of Conservation Concern (USFWS 2008), or species that are regionally identified as having current viability concerns. Population trends for these species from breeding bird surveys from 1996─2010 indicate stable populations in Oregon for red-breasted nuthatch, hairy woodpecker, and downy wood pecker and increasing population trends for pileated woodpecker and red-breasted sapsucker (Sauer et al. 2012). A decline in northern flicker has been detected from 1996-2010. Northern flicker is a common resident species that is ubiquitous to most forest habitats in Oregon. They are most abundant in open forest habitat and along forest edges with available large (31 inches dbh or greater) snags (Marshall et al. 2003). Despite a recent decline in numbers, northern flickers are well above population levels that would suggest a viability concern.

A collection of information, referred to as DecAID, has been developed by Region 6 to help projects identify the levels of snags and downed logs required to meet wildlife population needs (Forest Service, 2012). At the landscape level, DecAID recommends providing dead wood at levels within the range of historic variability. The 5th field Upper McKenzie River watershed (59,969 acres) was used to evaluate deadwood at the landscape level for this project.

The median historic condition for this watershed was estimated using levels of snags and downed logs found in strategic plots in unlogged stands of various ages and an estimate of the normal distribution of seral stages derived from the assumed fire return interval. Median values are the mid-point where half of the time deadwood levels would be at or higher than that value and about half the time they would be at or lower than the value. Studies have indicated that fire frequency and severity varied considerably in the past due to substantial variability in weather conditions, and fire severity varied from century to century (Wimberley et al., 2000). Therefore, levels of dead wood have fluctuated considerably over time and plus or minus 50 percent of the estimated median value was used to approximate the historic range of variability.

DecAID evaluates deadwood levels by wildlife habitat type. The Upper McKenzie River watershed contains five different wildlife habitat types (Table 42). Treatment units within the Goose project are made up entirely of Westside Lowland Conifer-Hardwood Forest (WLCH_C). The other four habitat types, WODF, EMC_ECB, MMC, and PARK, do not have any activities proposed in them, and are thus not further discussed.

Table 42. Wildlife Habitat Types in the Upper McKenzie River Watershed

Wildlife Habitat Type	Acres
Eastside (Interior) Mixed Conifer Forest (EMC_ECB)	66
Montane Mixed Conifer Forest (MMC)	124,394
Open Parkland (PARK)	5
Westside Lowland Conifer-Hardwood Forest (WLCH_C)	59,969
Westside Douglas-fir Forest (WODF)	7,180

DecAID provides information on snag and down wood in three tolerance levels, 30 percent, 50 percent, and 80 percent. The 30 percent tolerance level is typically used when considering landscapes that have exhibited extensive harvest activity. The 50 percent tolerance level is typically used when considering matrix land allocations and 80 percent is typically used when considering late-successional reserves. These considerations are general guidelines and it is the responsibility of the biologist to interpret and use information from DecAID to best fit the needs of the area being analyzed.

An analysis was conducted at the forest level for all 5th field watersheds to determine the estimated current percentages of the landscape that contains various levels of large snag (>20 inches dbh) habitat (April 2013). Table 43 displays the results by Wildlife Habitat Type for the Upper McKenzie River 5th field watershed and shows where we are currently outside the estimated range of natural variability for large snags. There are currently just 11 percent of the acres in the tolerance level 80plus category compared to the estimated historic condition with a range of 10-30 percent. Various tolerance levels/intervals (tl) are displayed that show the proportion of the landscape in the wildlife habitat type that would contain the shown range of snag levels as shown in Table 44.

There have been a total of 801 wildlife trees created in various harvest units throughout history within the project area to mitigate for the loss of snags from timber harvest and ongoing fire suppression activities. Treatments used were blasting (164 trees), girdling (161 trees), girdle and inoculate (58 trees), inoculate (62 trees), sawtop (205 trees), and sawtop and inoculate (151 trees).

Table 43. Current Percentages of Landscape in Large Snags ($\geq$20inches dbh) in the Upper McKenzie River 5th Field Watershed for the WLCH_OCA Wildlife Habitat Type

HUC_10	HU_10_NAME	Wildlife Habitat Type	tl0to30	tl30to50	tl50to80	tl80plus	Total Acres
1709000402	**Upper McKenzie River**	**WLCH_OCA**	**22564 (38%)**	**9784 (16%)**	**20967 (35%)**	**6654 (11%)**	**59969**

HUC_10	HU_10_NAME	Wildlife Habitat Type	tl0to30	tl30to50	tl50to80	tl80plus	Total Acres
Median Historic Condition for Willamette National Forest (historic variability in parentheses)			30 (15-45)	20 (10-30)	30 (15-45)	20 (10-30)	

Table 44. Large Snags/Acre at Various Tolerance Levels for the WLCH_OCA Habitat Type

	Tolerance Limit		
	30	50	80
WCHL	**LG Snags/acre**		
large tree stands	4.25	6.11	11.66
small to medium tree stands	2.1	4.41	10.6

Large down wood as well as snag densities have varied considerably from one century to the next due to wide fluctuations in fire severity. Table 45 displays an analysis of the current levels of the Upper McKenzie River and project area landscape that contain various per acre levels of large logs. For example, about 19 percent of the landscape would be expected to contain about 2-4 large logs per acre for the predominant WLCH_OCA wildlife habitat type.

Table 45. Current Levels of the Landscape Containing Various Levels of per Acre Large Logs (>20 inches dbh) in the Upper McKenzie River 5th Field Watershed for the WLCH_OCA Wildlife Habitat Types

HUC_10	HU_10_NAME	Wildlife Habitat Type	0	0-2	2-4	4-6	6-8	Over 8
1709000403	Upper McKenzie River	WLCH_OCA	32%	22%	19%	13%	6%	7%

Snags in Westside Lowland Conifer-Hardwood Forest Habitat Type

Snags:

For Lowland Conifer/Hardwood Forests in the Upper McKenzie River Watershed, the estimated median number of large snags (>19.9" dbh) is 3/acre compared to an estimated historic median reference condition of 5/acre for the Westside Lowland Conifer/Hardwood Forests of the Oregon Cascades (Figure 26).

For Lowland Conifer/Hardwood Forests in the Upper McKenzie River Watershed, the estimated median number of snags (>9.9" dbh) is 8/acre compared to an estimated historic median reference condition of 12/acre for the Westside Lowland Conifer/Hardwood Forests of the Oregon Cascades (Figure 27).

Wildlife Relationship on Snag and Downed Log Abundance:

DECAID provides a compilation of studies showing relationships of snag and downed wood abundance to wildlife occupancy of the site for a variety of wildlife species. These are expressed as tolerance levels. For example, the 50 percent tolerance level for large snags for nesting pileated woodpeckers is 7/acre for Westside Lowland Conifer/Hardwood Forests of the Oregon Cascades. This number indicates that half of pileated woodpeckers studied in this wildlife habitat would be expected to nest at sites with 7 or fewer large (>19.9" dbh) snags/acre. Many factors influence the population density and habitat selection of species that are associated with dead wood abundance. In general though, the greater the abundance of snags and downed wood and the larger the snags and downed logs, the higher quality habitat conditions for the “dead wood dependent” species, and standards and guidelines for retaining snags and downed wood were developed around these relationships.

Snags densities above the 50 percent tolerance level were used to estimate the amount of high-quality habitat for the species, while the amount of habitat meeting the 30−50 percent tolerance interval were used to represent the amount of “moderate quality” dead wood habitat.

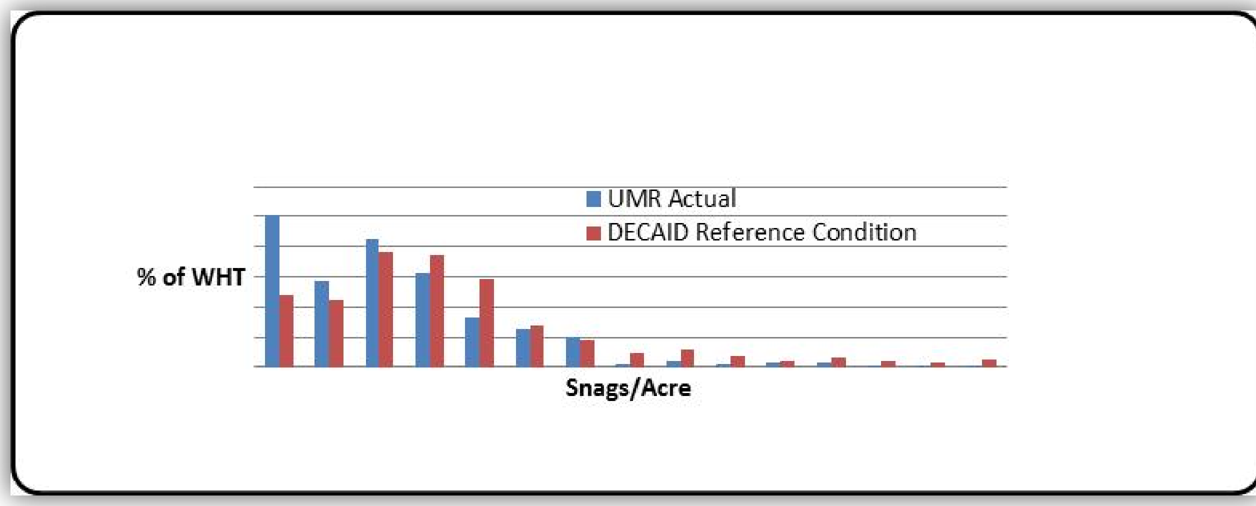

Figure 26. Comparison of Current Large (>19.9" DBH) Snag Densities in Westside Oregon Cascade Lowland Conifer/Hardwood Forests in the Upper McKenzie River Watershed to Reference Conditions

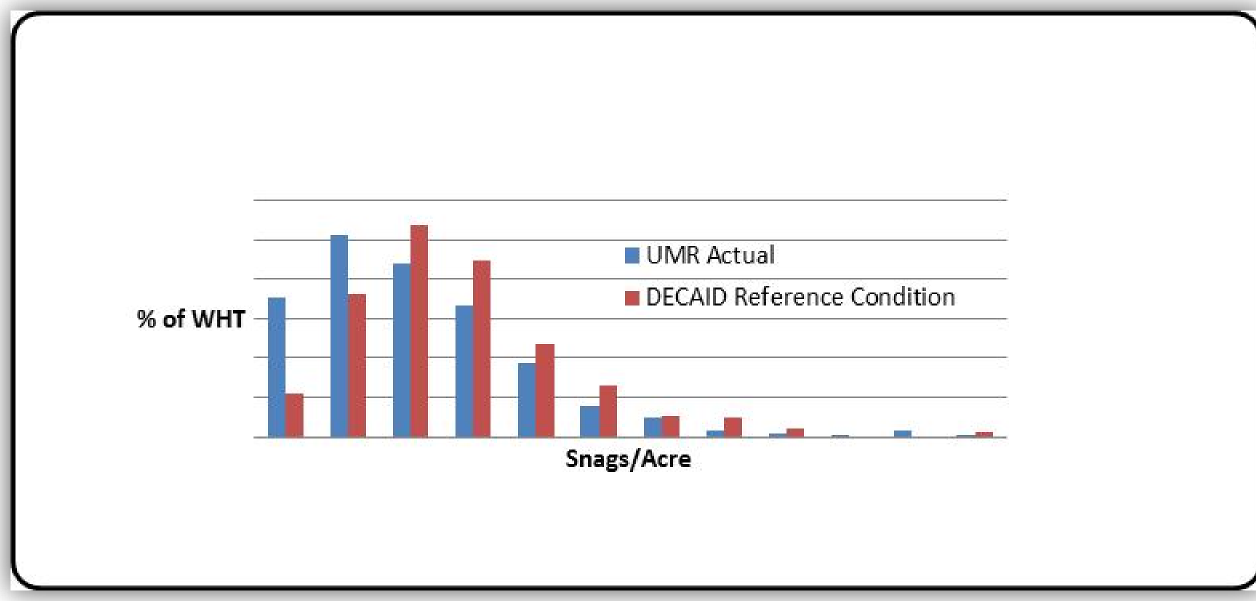

Figure 27. Comparison of Current (>9.9" DBH) Snag Densities in Westside Oregon Cascade Lowland Conifer/Hardwood Forests in the Upper McKenzie River Watershed to Reference Conditions

Species-specific information in DECAID was reviewed for species found in the project watershed with snag and downed wood relationship studies comparable to the forest inventory plot data. From these studies, selections were made for TES species, MIS species, and key prey species of northern spotted owl and compared species tolerance levels to estimated current and historic snag and downed wood abundance. DECAID provided tolerance levels for the following species:

1. Westside Lowland Conifer/Hardwood Forests of the Oregon Cascades:
    a. pileated woodpeckers-MIS (large snag density at nesting and foraging sites, large log cover *at foraging sites) and
    b. northern flying squirrel-important prey for NSO (total snag densities and total log cover** in occupied habitat)

    **DECAID shows information for % total log cover >19.9 cm dbh compared to >19.9” dbh in the inventoried plot data.*

    ***DECAID shows information for % total log cover >3.9” dbh compared to >4.9” dbh in the inventoried plot data. Only the 50% tolerance level is given in DECAID for % total log cover for marten.*

Tables 46 and 47 show estimated current acres of each wildlife habitat type (WHT) in different snag and downed wood densities based on Gradient Nearest Neighbor analysis of forest inventory plot data (LEMMA 2009) for the watershed. A historic reference condition is also developed using snag and downed wood abundance derived from plot data in unmanaged stands throughout the habitat type and an assumed fire regime interval for the watershed that estimates the average amount of the habitat in different successional stages. This information is calculated for both total snags (>9.9” dbh) and downed logs (>4.9” dbh) and for large (>19.9” dbh) logs and snags. Snag data are given as snags/acre and downed wood data are given as percent of cover.

Table 46. Estimated percent of Forest Habitat Type (WHT) Meeting Snag Density Tolerance Levels for Key Wildlife Species

Current Condition vs. DECAID Historic Reference Condition, UMR Watershed				
Habitat and Wildlife Species Use	Dead Wood Feature	Wildlife Tolerance Level	Percent of Habitat Meeting T. L.	
			Current Condition	DECAID Historic Reference
Westside Lowland Conifer/Hardwoods, Oregon Cascades				
Pileated Woodpecker				
Nesting Sites	Snags>19.9”dbh	≥30 T. L.	34%	51%
	Snags>19.9”dbh	≥50% T. L.	19%	32%
Foraging Sites	Snags>19.9”dbh	≥30% T. L.	17%	27%
	Snags>19.9”dbh	≥50% T. L.	4%	13%

Current Condition vs. DECAID Historic Reference Condition, UMR Watershed				
Habitat and Wildlife Species Use	Dead Wood Feature	Wildlife Tolerance Level	Percent of Habitat Meeting T. L.	
			Current Condition	DECAID Historic Reference
Northern Flying Squirrel				
Occupied stand	Snags>9.9”dbh	≥30% T. L.	64%	82%
	Snags>9.9”dbh	≥50% T. L.	41%	58%

The large snag analysis suggests that currently the UMR watershed is below historical levels for large snags in Westside Lowland Conifer/Hardwood habitat and providing less nesting and foraging habitat for pileated woodpeckers than was provided in the estimated historic condition (Table 46). Only an estimated 19 percent of this habitat meets or exceeds large (>19.9” dbh) snag densities at the 50 percent tolerance level for pileated woodpecker nesting sites compared to 32 percent of the estimated historic habitat. Only an estimated four percent of the habitat meets or exceeds large snag densities at that tolerance level for pileated woodpecker foraging sites compared to 13 percent of the estimated historic habitat.

The total snag analysis also shows that currently the UMR watershed is below historical levels for snags in Westside Lowland Conifer/Hardwood habitat and providing less snag habitat for northern flying squirrels than was provided in the estimated historic condition (Table 46). Only an estimated 41 percent of this habitat meets or exceeds total (>9.9” dbh) snag densities at the 50 percent tolerance level for occupied northern flying squirrel sites compared to 58 percent of the estimated historic habitat.

Downed Logs:

For Lowland Conifer/Hardwood Forests in the UMR Watershed, the estimated median percent cover of large logs (>19.9” dbh) is 3 percent compared to an estimated historic median reference condition of 1.5 percent for the Westside Lowland Conifer/Hardwood Forests of the Oregon Cascades (Figure 28).

For Lowland Conifer/Hardwood Forests in the UMRWatershed, the estimated median percent cover of downed logs (>4.9” dbh) is 4.5 percent compared to an estimated historic median reference condition of 5 percent for the Westside Lowland Conifer/Hardwood Forests of the Oregon Cascades (Figure 29).

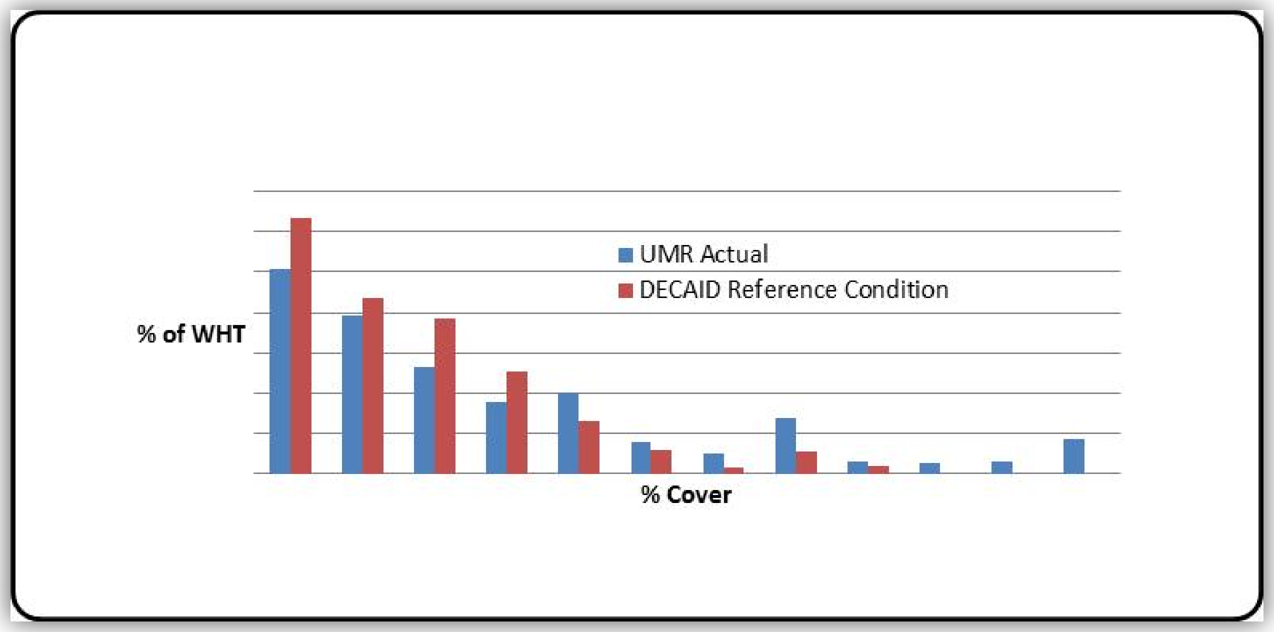

Figure 28. Comparison of Current % Cover of Large (>19.9" DBH) Downed Logs in Westside Oregon Cascade Lowland Conifer/Hardwood Forests in the Upper McKenzie River Watershed to Reference Conditions

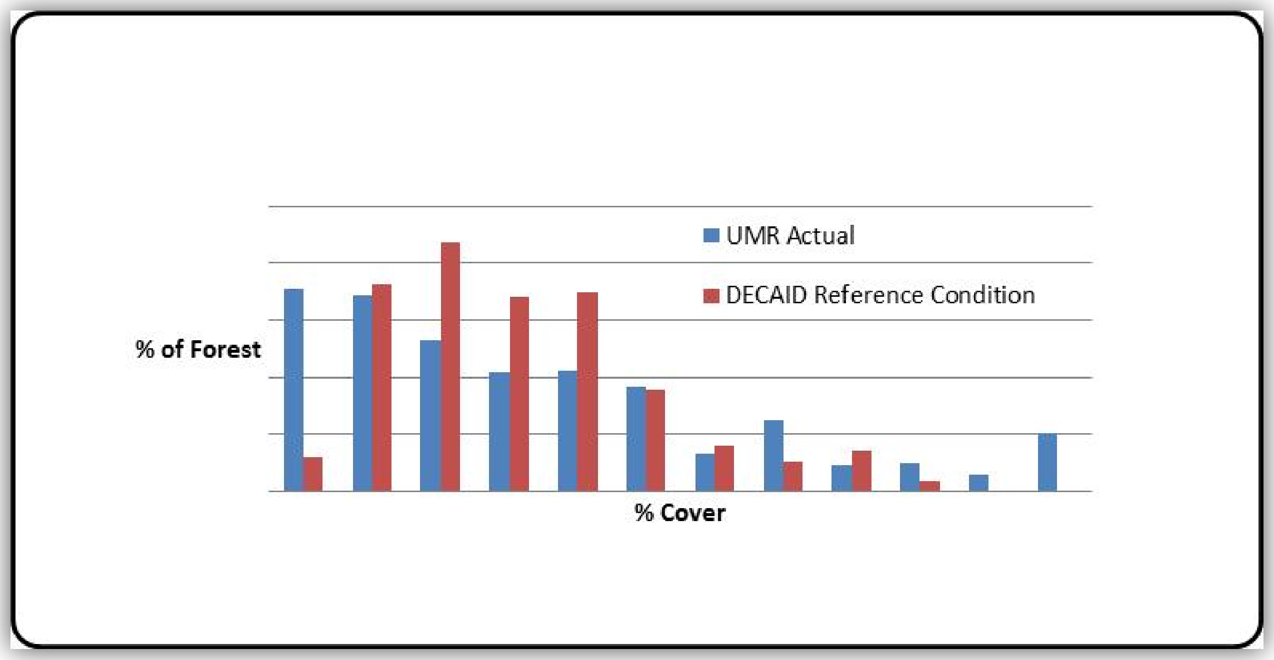

Figure 29. Comparison of Current % Cover of Total (>4.9" DBH) Downed Logs in Westside Oregon Cascade Lowland Conifer/Hardwood Forests in the Upper McKenzie River Watershed to Reference Conditions

Table 47. Percent of Forest Habitat Meeting Downed Log Cover Tolerance Levels for Key Wildlife Species

Current Condition vs. DECAID Estimated Historic Reference Condition, UMR Watershed				
Habitat and Wildlife Species Use	Dead Wood Feature	Wildlife Tolerance Level	% of Habitat Meeting T. L.	
			Current Condition	DECAID Historic Reference
Westside Lowland Conifer/Hardwoods, Oregon Cascades				
Pileated Woodpecker				
Foraging Sites	Logs>19.9"dbh*	>30% T. L.	>56%*	>48%*
	Logs>19.9"dbh*	>50% T. L.	>46%*	>33%*
Northern Flying Squirrel				
Occupied stand	Logs>4.9"dbh**	>30% T. L.	61%	72%
	Logs>4.9"dbh**	>50% T. L.	39%	36%
**DECAID shows information for % total log cover >19.9 cm dbh compared to >19.9" dbh in the inventoried plot data. Thus the % of habitat in the above the tolerance limit is substantially underestimated, but is shown to compare the relative difference between the current and historic condition. **DECAID shows information for % total log cover >3.9" dbh compared to >4.9" dbh in the inventoried plot data. Thus the % of habitat in the above the tolerance limit is somewhat underestimated. Only the 50 percent tolerance level is given in DECAID for % total log cover for marten.*				

The downed log analysis indicates that currently the UMR watershed is above historical levels for large downed log cover in Westside Lowland Conifer/Hardwood habitat (Figure 5) and is providing more large downed log foraging habitat for pileated woodpeckers than was provided in the estimated historic condition (Table 47). Currently an estimated 46 percent of this habitat meets or exceeds large log cover at the 50 percent tolerance level for pileated woodpecker foraging sites compared to 33 percent of the estimated historic habitat.

The downed log analysis indicates that currently the UMR watershed is slightly below historical levels for total smaller downed log cover in Westside Lowland Conifer/Hardwood habitat, but providing comparable amounts of downed log habitat for northern flying squirrels as was provided in the estimated historic condition. Currently an estimated 39 percent of this habitat meets or exceeds total downed log cover at the 50 percent tolerance level for northern flying squirrels habitat compared to 36 percent of the estimated historic habitat (Table 47).

Represented below are Forest Vegetation Simulation (FVS) model runs used to display snags/acre over time showing the No-Action alternative and the two action Alternatives 2 and 3 (Figures 30 and 31). Stand exam data was used to assess current snag numbers. The gray shaded area represents the 30-80 tolerance levels from DecAID.

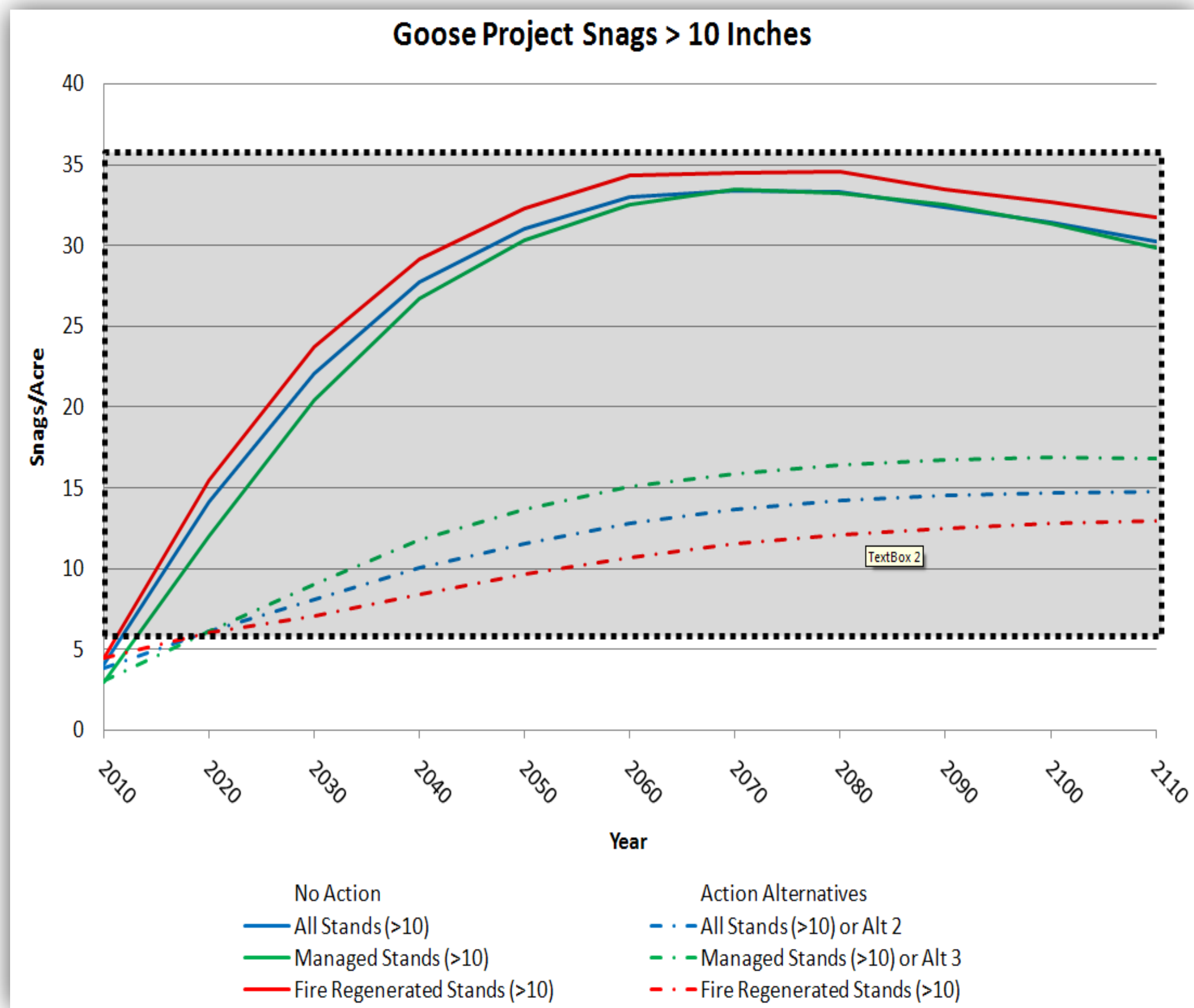

Figure 30. Forest Vegetation Simulation (FVS) Showing Short and Long Term Changes to Snags >10 inches in the Goose Project Area

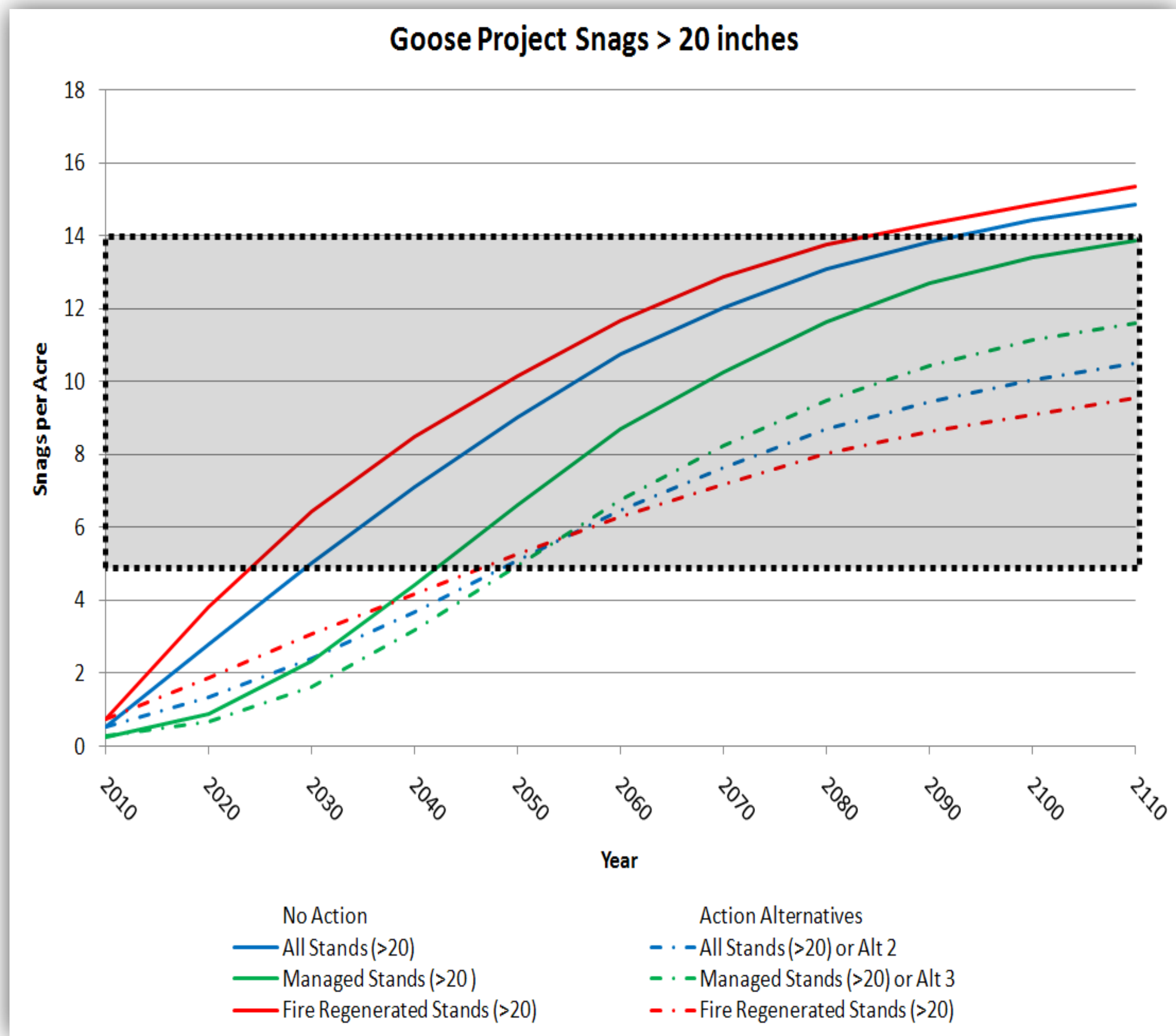

Figure 31. Figure 10 Forest Vegetation Simulation (FVS) Showing Short and Long Term Changes to Snags >20 inches in the Goose Project Area

Elk and Deer

Elk and deer are Forest MIS, not because of viability concerns, but because they are important big game hunting species in Oregon. The project area is in the state-designated McKenzie Wildlife Management Unit (WMU). Since the beginning of the Willamette Forest Plan in 1990, deer numbers and hunter success have fallen by more than 50 percent and elk numbers have declined substantially below Oregon Wildlife Population Management Objectives (Forest Service 2011) in that WMU. Reduced forage quality and quantity due to the reduction in clearcut logging on the National Forest are important factors in this decline.

Table 48. HEI Analysis for Elk Habitat in the Goose Project Area-Current Condition

Emphasis Area Name	Emphasis Rating	Results for Model Variables*					
		HEs	Her	HEc	HEf	Overall HEI	
Florence	High	0.73	0.44	0.49	0.33	0.48	
Belknap-Paradise	Moderate	0.67	0.65	0.49	0.39	0.54	
N. Side Horse	Moderate	0.80	0.42	0.47	0.27	0.45	
White Branch	Moderate	0.39	0.61	0.34	0.56	0.46	

Target Levels:
High Emphasis Area - Individual Index: >0.5 Overall Index: >0.6.
Moderate Emphasis Area - Individual Index: >0.4 Overall Index: >0.5.
Low Emphasis Area - Individual Index: >0.2 Overall Index: increase any variable <0.2.

Values shown in yellow shaded boxes are below recommended minimum threshold levels in the Willamette National Forest Plan.

1 Elk were once also thought to require thermal cover in order to maintain body temperature. Recent work in northeast Oregon has shown this is not the case (Cook *et al.* 1998). No beneficial effects of thermal cover were demonstrated.

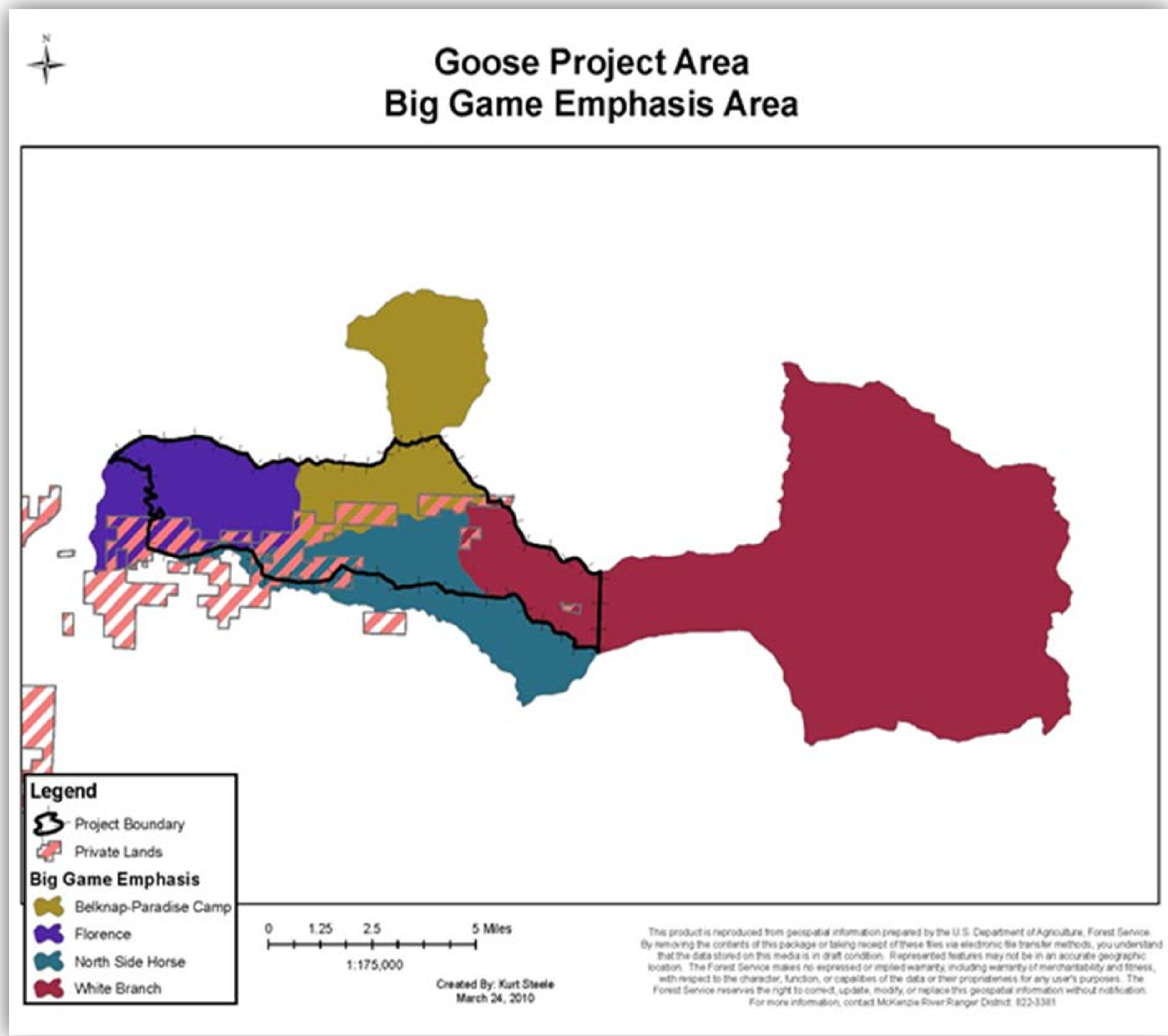

Figure 32. Goose Project Area Elk Emphasis Areas

Management objectives for deer and elk habitat apply to specific mapped "Emphasis Areas" within the Willamette National Forest. Each emphasis area has been assigned a rating of high, moderate, or low. Standards and Guidelines for management of these areas were developed in cooperation with the Oregon Department of Fish and Wildlife. The Goose planning area includes portions of four designated emphasis areas: Florence, Belknap-Paradise, North side Horse, and White Branch (Figure 32). The Florence emphasis area has a high quality rating while the other three areas are rated as moderate. These areas are managed for elk habitat under guidance from the Willamette Forest Plan Standards and guidelines (FW-137) with the assumption that providing high quality elk habitat would adequately address the needs for black-tailed deer.

Elk Model for Goose Project Area

A Model to Evaluate Elk Habitat in Western Oregon (Wisdom 1986) was used to estimate habitat effectiveness (HE), (Willamette National Forest Plan 1990), which is defined as the proportion of achievement relative to an optimum condition. The management intent is to maintain effectiveness within a range of values with the optimum value being 1.0. HE incorporates and qualifies four key habitat attributes: size and spacing of forage (HEs), quality of forage (HEf), cover areas (HEc), and open road density through elk habitat (HEr). Each habitat variable is calculated individually and allows for a comparison by variable or as a whole (HEI). The elk model considers past and ongoing activities and results in an evaluation of the cumulative impacts on habitat from the past, present, and foreseeable future actions in the emphasis areas.

Maintaining a balance between cover and forage areas is a key component of elk habitat management in the Wisdom model. However, Cook et al. (1998) found that thermal cover did not enhance elk survival and production. They also found that thermal cover was not required by elk where food was not limiting, and could not compensate for inadequate forage conditions. Further research has shown that high summer and fall forage quality is critical to elk reproduction, survival, and population growth and stability (Cook et al. 2004). The increased importance of available forage abundance and quality, compared to thermal cover has also been supported by nutritional and physiological studies of black-tailed deer (Parker et al. 1999).

The Wisdom model was developed to evaluate landscape areas where quality forage areas were provided primarily by clear cutting and associated post-harvest burning and fertilization. With the dramatic decline in regeneration timber harvest under the Northwest Forest Plan, there has been a corresponding decline in high-quality elk forage habitat. This trend, coupled with recent studies, has increased the importance of providing foraging habitat for elk.

A drawback of the Wisdom model is that forage is evaluated based on the average value of defined forage areas and does not consider the amount of forage provided. Areas that provide meaningful forage are not considered in the forage effectiveness calculations. For example, providing substantial acres of temporarily improved elk and deer forage conditions by commercial thinning may result in a lower forage score in the Wisdom model. Research shows that commercial thinning, especially the proposed gaps and dominant tree release treatments to a lesser extent, would improve the quantity of understory herbaceous and shrub forage (Beggs and Puettman 2003). This is judged to benefit forage conditions for elk and deer within the analysis area regardless of the average forage value derived from the Wisdom model.

Another example for which the model does not effectively show results due to the averaging nature of the values is for cover values. If thermal habitat is thinned and temporarily loses its' thermal value, the model increases the cover value because a greater amount of remaining cover may be optimal cover. Table 48 displays the current condition of habitat values for patch size and spacing (HEs), open road density (HEr), cover quality (HEc), forage quality (HEf), and overall habitat quality (HEI) for elk habitat. The insensitivity of the Elk Model to reflect changes in habitat is apparent when trying to compare HE values for various Alternatives. Therefore a description of changes is reflected in the narrative below in reference to the current HE values found in Table 48.

Past harvest activities have shaped the landscape in terms of the types of elk habitat. Harvest treatments were primarily regeneration, which included clearcuts and regeneration harvest. These harvested units once provided a wealth of quality forage for elk but have since grown into hiding and thermal cover. The Oregon Department of Fish and Wildlife developed statewide management plans for elk and black-tailed deer (ODFW 2003, ODFW 2008) that note the need for higher quality forage areas on National Forest lands. With the cessation of large-scale clearcutting in Northwest National Forests, forage quality and populations have declined on the Willamette National Forest for both deer and elk as estimated from

1990-2010. Elk harvests and hunter success peaked in the late 1990s and have declined since then (ODFW 2003). The estimation of elk numbers is not an exact science. The professional consensus of ODFW area managers (based on minimum known elk numbers, estimates of animals missed during surveys, and the amount of areas lacking counts) is that the Wildlife Management Unit that overlaps the project area is substantially below State Population Management Objectives (Brian Wolfer, pers. com. 2014).

Marten

Marten are members of the weasel family that prefer mature and old conifer-dominant forest habitat and use cavities in snags and logs for denning, resting, and natal sites. Recent information suggests that marten primarily only occur in montane conifer forests above about 4000’ elevation on the Forest. An ongoing carnivore detection study in the Mt Jefferson, Mt. Washington, and Three Sisters Wilderness Areas on the Willamette and Deschutes National Forests found all sites sampled above that elevation to be occupied by marten (Hiller and McFadden-Hiller 2013).

3.5.14 Environmental Consequences – Management Indicator Species

Cavity Excavators, Pileated Woodpecker, and Deadwood Abundance

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would have no impact on any cavity excavator MIS or pileated woodpeckers and would not affect current levels of snags and dead wood. The forest would continue to develop towards old-growth and this should result in a future increase in large snags and large downed logs in those stands and improve future habitat for woodpeckers that prefer old forest habitat, such as the pileated woodpecker. There would be no increase in habitat for species, such as northern flicker, that prefer forest edges and open forest habitat with large snags. There would be no additional wildlife tree and large down wood creation.

Alternatives 2 and 3

Snag abundance may initially decline on 2,058 and 746 acres of forest in Alternatives 2 and 3, respectively. It should be noted that these acres exceed the total harvested acres shown in Table 2.5 because the latter exclude skips, gaps and untreated Riparian Reserves, all of which may be impacted if they contain older snags that pose a safety hazard to the logging operations. Many of the plantations proposed for thinning in both alternatives have low or no large snags present currently, so few large snags are expected to be lost in those areas. Goose design features (Tables 2.8 and 2.9) to create snags in the regeneration units in Alternative 2 (Units 690, 691, and 720) as well as the thinned portions of Riparian Reserves (Units 70, 320, 330, 340, and 350) , and protect existing snags where possible would mitigate this effect. Down wood mitigation would also occur in the thinned portions of Riparian Reserves (Units 70, 320, 330, 340, and 350). In addition, there is a design feature to enhance snag and down wood habitat in other units (Tables 2.6, 2.7, 2.9, and 2.10).

For the regeneration harvest units, these recommendations would retain snags in the harvest units at 100 percent population potential (Neitro et al. 1985), well above the minimum Forest Plan standard of 40 percent. Areas with relatively higher levels of snags may also increase over time, especially within those units that had a higher number of snags to be created recommended. In the long-term over many decades, there would be fewer snags on the stands to be managed under the Goose project compared to Alternative 1 (Figure 3.5.10). Prescribed underburning and wildlife tree treatments would help improve this habitat.

With the Goose project design features (Table 13) that recommend post-harvest monitoring and falling 0-5 trees per acre if these levels are not present, downed wood levels would initially increase on 2,058 and 746 acres of forest in Alternatives 2 and 3, respectively. The level of dead wood creation would exceed the minimum levels needed under Forest Plan standards and guidelines for regeneration harvest. Created snags would also contribute to future dead wood in the units, but, long-term over 100 years or more, there would be less downed wood in the harvested acres compared to Alternative 1because timber harvest would remove much of the future deadwood source.

The proposed Goose harvest alternatives would affect snags and downed logs on about 11 percent of the project area with Alternative 2, and about 4 percent with Alternative 3. The only other timber harvest which is currently reasonably foreseeable on Forest Service lands in the project area is the Eagle Timber Sale which would harvest an additional 176 acres. Clearcut harvesting is expected to continue on the 3,219 acres of private lands in the northwest area of the watershed. These private lands are mostly previously logged forests with current low levels of snags and downed logs. Considering cumulative effects, downed wood levels in the Upper McKenzie River watershed are expected to remain within historic levels and increase over time as past regeneration harvest areas on federal lands mature. Snag levels in the watershed are expected to remain within the historic range of variability in the Westside Lowland Conifer-Hardwood Forest habitat. Snag levels are expected to increase over time as past regeneration harvest areas on federal lands develop towards mature and older forest stages.

Because leave trees would be retained, and snags and downed logs would be created well above minimum Forest Plan Standards and Guidelines, the proposed Goose project would temporarily degrade, but not remove, habitat for most cavity excavators.

There may be benefits to treating the older stands above 80 years of age in Alternative 2 to Northern flickers since they prefer large snags, forest edges, and open forest habitat, all of which would be created by the proposed silviculture treatments.

Pileated woodpeckers are also expected to continue to use the older stands after treatment since they are known to use shelterwood harvest areas (Forest Service 1990: III-73). Assuming that suitable owl habitat would be preferred pileated woodpecker habitat, Alternative 2 would degrade 424 acres and remove 2 acres, or about 6 percent of this habitat in the project area. Alternative 3 would not harvest any suitable spotted owl habitat and would thus not degrade any pileated woodpecker habitat. While the 60 acres of prescribed underburning in both alternatives may burn a few individual snags if they are a safety hazard during the burning, additional snag habitat is also expected to be created through a minor amount of individual tree mortality. This would benefit dead wood dependent species and the overall ecology of the landscape.

Cumulative Effects

Alternative 1 – No Action

Because there would be no impacts to cavity excavator MIS, pileated woodpeckers or dead wood with Alternative 1, there are no cumulative effects to consider.

Alternative 2 and 3

Using the combined acres of suitable and dispersal owl habitat, which represent forests with trees capable of producing 11 inches and larger snags, as a proxy for general cavity excavator habitat, Alternatives 2 and 3 would degrade 11 and 4 percent of the habitat in the project area, respectively. Hazard tree removal along the haul route is also expected to result in a very slight additional decrease in snag habitat within the planning area. The recently completed Eagle and 13 Thin Timber Sales thinned about 336 acres of forest habitat in the project area which resulted in the loss of some cavity nester habitat. The Pass Thin Project, which is currently being planned, would also thin about 21 acres and could result in minor loss of snags. The private lands that make up 18 percent of the project area are expected to remain relatively poor habitat for cavity excavator MIS and pileated woodpeckers. Because Alternatives 2 and 3 would impact only a small amount of the available habitat, snag and downed wood mitigation measures would be implemented, the individual MIS species are not on any viability "watch-list", and, considering cumulative effects, future down wood and snag levels are expected to increase as past clearcuts on Forest Service lands mature,. Alternatives 2 and 3 are both expected to maintain population viability of cavity excavator species and pileated woodpeckers in the project area and McKenzie River watershed, and would not contribute to any loss of viability of these species at the larger Forest scale.

Elk and Deer

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current low quality big game forage levels in the project area. Current trends of elk habitat development would occur naturally over time with Alternative 1. Existing elk foraging habitat within open plantations would continue growing denser into hiding cover and then into thermal cover. Some of the current foraging habitat areas are in higher elevation frost pockets that may be maintained in a long-term (>50 years) foraging habitat condition. The few very, small meadow habitats would undergo slight levels of tree encroachment. With Alternative 1, current elk effectiveness ratings would not change significantly within the next few decades. While the overall amount of low quality forage may continue to decrease herd health, there may also more elk damage issues in local home gardens in the Goose project area.

In ten years, forage availability would be expected to decrease in this area as current harvest openings grow into hiding cover. In the absence of additional harvest or wildfire, no new foraging areas would be created. Current amounts and quality of optimal and thermal cover would not significantly change. In 50 years, approximately 30 percent of the existing thermal cover would shift into optimal cover. Road density and big game security would not change. Overall habitat quality would decrease from the loss of forage. No foreseeable timber or fuels management activities are scheduled to occur in the analysis area that could contribute to incremental cumulative effects on elk habitat.

Alternatives 2 and 3

Commercial thinning on 1,218 acres (Alternative 2) and 469 acres (Alternative 3) would change the function of elk habitat from thermal cover to mostly lower quality thermal cover that contains small inclusions of forage areas. Units with a final canopy below 40 percent would not provide thermal cover for 7-15 years and be modified hiding cover. However, these more open units would show improved forage habitat conditions compared to those with higher final canopies above 40 percent. Improved forage habitat in the thinned areas would be relatively short lived. The understory would show temporarily improved shrub and forb development due to increased sunlight within stands. There are three units proposed for regeneration harvest with Alternative 2 that would contribute approximately 43 acres of high quality big game forage potential and are expected to provide early seral habitat for 15-20 years.

Early seral foraging habitat would also be created by cutting 1-to-3 acre gaps within thinning units to provide small forage openings totaling 281 acres with Alternative 2, and 111 acres with Alternative 3. Gap forage values would remain higher longer, than in the thinned matrix and adaptive management areas surrounding the gaps, depending on tree regeneration within the created gaps.

There are seven units: 60, 70, 620, 640, 710, 760, and 770 that have been proposed for enhancement for big game forage. The canopy cover in these units would be reduced to approximately 30 percent to allow sunlight to reach the forest floor and stimulate forage species for big game.

Additional benefits to forage quality would occur in the units proposed for post-harvest under burning (477 acres with Alternative 2, and 178 acres with Alternative 3), which would stimulate understory vegetation growth. Post-harvest underburning, would provide greater benefit to elk and other species dependent on early seral habitat. This action is not apparent in the model results because the Wisdom model does not consider the effects of under burning on a commercially thinned area. After thinning thermal habitat quality would be low for several years. At this time, thermal habitat quality would be improved slightly because trees would have been released, growing taller and larger canopies. Additional understory development would also benefit thermal habitat quality.

Alternative 2 would include approximately one mile of new road construction with the road being stored after completion of harvest activities in comparison to no new road construction with Alternative 3.There would be no change to open road densities for either Alternative 2 or 3. Implementation of either action alternative would result in an increase in disturbance throughout the implementation timeframe of this project (2-10 years) due to an additional seven miles of temporary roads and increased traffic to access thinning stands. All temporary roads would be removed once activities are completed.

Past management activities initially resulted in an abundance of forage habitat with the many acres of regeneration harvesting that occurred. More recently, a lack of regeneration harvest has allowed these forests to grow into hiding and thermal cover to create the current condition represented by Alternative 1, the No-Action alternative. The overall impact of the proposed action is that thermal cover in treated stands would be changed to lower quality thermal cover, hiding cover, or forage. Additional thermal cover does not enhance elk survival or production (Cook et al.1998).

Cumulative Effects

Alternative 1 – No Action

It is expected that with Alternative 1, most of the higher quality elk and deer habitat would be created at the lower elevations on private land. Combined with other ongoing projects such as the recently completed 13 Thin and Eagle Timber Sales, as well as the future Pass Thin Project, elk forage habitat conditions would continue to remain at an overall low quality within the Goose project area.

Alternatives 2 and 3

Past actions that have improved elk habitat in the project area include approximately 764 acres of commercial thinning that occurred between 1993 and 2014, some of which included heavier thins and small gaps which improves elk forage conditions more than moderate thinning. Forage created by timber harvest generally lasts about 15-20 years until the stands growth into dense plantations that provide les forage. The recently completed 13 Thin and Eagle Timber Sales also improved about 336 acres of forage habitat conditions and included small gap treatments. Other foreseeable actions that would modify habitat in these Elk Emphasis Areas include the 21 acre Pass Thin Project which would thin a second growth plantation and result in improved forage habitat conditions. In the context of the Emphasis Areas and adjacent 5th field watersheds, the Goose project effects would result in a minor contribution to cumulative effects that have already occurred from past management actions surrounding the project area. Given what is currently known about local deer and elk populations, the future viability of these species is assured and they would continue to benefit from habitat restoration opportunities that continue to be implemented – especially when conducted at an appropriate scale.

Marten

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1would maintain the current forest habitat and the stands would continue to develop large diameter trees, large snags, and large downed logs as the stands progress into old growth forests. Structural features that marten prefer would continue to increase over time.

Alternative 2

Alternative 2 would thin about 55 acres above 4000’ elevation with unit 10, however, due to the south facing aspect this area does not qualify as montane conifer habitat which appears to a preferred forest type used by marten. Unit 10 tops out on Lookout Ridge and due to the south facing aspect, does not qualify as montane conifer forest habitat suitable for marten. Unit 10 connects with the east-west ridge which contains more of the montane habitat type on the north side. Other than unit 10, the remaining Goose units are in Westside Lowland Conifer-Hardwood Forest habitat below 4000’ elevation and are thought to be marginal marten habitat due to forest type and elevation.

With the mitigation and enhancement activities for wildlife tree and down log creation activities, structural elements that make up higher quality marten habitat would be improved which may benefit marten. Because of the extremely limited extent that the Goose project would affect the preferred higher elevation montane mixed forest habitat, overall impacts to marten are judged to be discountable. With implementation of the Goose project, the long-term (>50 years) viability of marten populations is expected to continue to persist across the Willamette National Forest in this habitat type.

Alternative 3

Alternative 3 would neither include any regeneration harvest, nor would it include unit 10 which is the only unit that has any area above 4000’ elevation where marten would generally occur. For this reason, Alternative 3 would not impact marten.

Cumulative Effects

Alternative 2 and 3

Because there are no impacts to marten, the Goose project has no cumulative effects on this species.

3.5.19 Affected Environment – Migratory Birds

Migratory birds are protected under the Migratory Bird Treaty Act of 1918 (16 U. S.C. 703-704). The U.S. Fish and Wildlife Service is the lead federal agency for managing and conserving migratory birds in the United States. However, under Executive Order (EO) 13186, all federal agencies are charged with the conservation and protection of migratory birds. A Memorandum of Understanding (MOU 2008) between the Forest Service and U.S. Fish and Wildlife Service requires, during NEPA planning, that the FS, to the extent practical, evaluate and balance long-term benefits of projects to migratory birds against any short- or long-term adverse effects. It also requires the FS to consider approaches, to the extent practical, for identifying and minimizing take of migratory birds that is incidental to otherwise lawful activities. Region 6 has compiled some information to assist biologists in disclosing effects to avian species during NEPA planning (Forest Service and Bureau of Land Management 2013). Effects to FS sensitive birds, federally ESA listed birds, and birds that are Management Indicator Species have been addressed above. Four additional migratory bird species that have been identified by USFWS as Species of Conservation Concern in the Northern Pacific Forest (USFWS 2008) and that have habitat in the proposed treatment units are addressed in this section. These four species are northern goshawk, Rufous hummingbird, olive-sided flycatcher, and purple finch.

An emerging concern for migratory birds in the Pacific Northwest is declining early-successional forest habitat (Swanson et al. 2010). Early seral conifer habitat is important habitat for many migratory bird species, including three of the above Species of Conservation Concern (Altman and Hagar 2007). In particular, there is a lack of complex early seral habitat, which is early successional forests with abundant and diverse shrub understory composition, high abundance of large diameter snags and downed logs, and substantial green tree retention. While private logging lands may create early seral habitat, large diameter snags, downed logs and live leave trees are rarely retained in any quantity, and shrub and forb understory species may be suppressed by herbicide treatments.

3.5.20 Environmental Consequences – Migratory Birds

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1would have no direct effect on migratory bird habitat and would not increase habitat for early-seral species. The Goose units would continue to develop towards old growth forest conditions, resulting in improved nesting and foraging habitat for northern goshawks and other species that prefer this habitat.

Alternative 2

Alternative 2 would remove about 45 acres over 80 and up to 127 years of age, and thin about 381 acres over 80 and up to 127 years of age. These older stands provide habitat for bird species like the northern goshawk, which prefer older conifer forests. These stands currently provide foraging and potential nesting areas for goshawks. No goshawks have been reported from any of the proposed Goose units. Protocol nest surveys have not been completed. Mitigation measures would protect any raptor nests that are incidentally found in the harvest units during layout or implementation. Retention of some overstory trees would slightly reduce the amount of time required to regenerate the stands back to foraging and nesting habitat. In about 80 years after timber harvest, the treatment units would return to suitable goshawk foraging and nesting habitat. Using suitable spotted owl habitat as a proxy for suitable goshawk habitat, Alternative 2 would impact less than 1 percent of the suitable goshawk habitat in the project area.

Alternative 2 would also include about 281 acres of 1-3 acre gaps, and about 50 acres of dominant tree releases. About 204 of those acres would not be planted following harvest. Planting would be required in gaps that have greater than or equal to 25 percent of the unit in gaps. Gaps located more than ½ mile from a road may not be planted due to the higher cost of planting and the potential to serve as higher quality early seral habitat.

Not planting the gaps would benefit migratory birds that use this complex early seral habitat. Gap placement would avoid steep, rocky areas and favor deep soils and areas where the understory would readily develop. The resulting open habitat is expected to last for about 15 years at the lower and moderate elevations up to about 3500’ in the one-acre gaps until they fill in naturally with conifer seedlings. The larger 2-3 acre gaps may remain as open habitats for about 20 years if they are not planted. Lower elevation gaps are expected to close in faster than higher elevation gaps. The species mix in the lower elevation gaps would differ somewhat from the gaps above 3500’. Lower elevation gaps would include vine maple, deerbrush, red alder, Oregon grape, red huckleberry and native grasses and forbs. The higher elevation gap species may include huckleberry, beargrass, vine maple, native grasses and many flowering forbs, the seeds of which benefit some species of migratory birds, as well as pollinators.

Alternative 3

No regeneration harvest or open early seral habitat would be created with Alternative 3. Benefits to migratory birds that use complex early seral habitats would occur with the 143 acres of proposed 1-3 acre gaps in thinning units, as well as the about 30 acres of dominant tree releases. This alternative would provide fewer benefits to early seral dependent land birds than Alternative 2.

Alternatives 2 and 3

Both action alternatives are consistent with the Migratory Bird Treaty MOU. Seasonal restrictions are recommended in the Goose design features (Table 13) to conduct hazard tree falling outside the critical nesting season, as well as tree felling, yarding and prescribed unit underburning on specific units to protect owls. This would minimize disturbances to nesting migratory birds and reduce the likelihood of harm to individual birds. It is not operationally feasible to seasonally restrict falling operations in every harvest unit. Designs features to retain existing snags where possible, and to retain live trees, create snags, and fall trees for dead wood sources would provide structural features migratory birds would use.

There is a design feature (Table 13) to consider late winter or fall for prescribed underburning which would reduce impacts to nesting birds and their young. The traditional timeframe for spring underburning between March and late June coincides with the nesting period for most migratory birds. Fire in harvest units during nesting season may cause nest abandonment or mortality of eggs or juveniles. In past years, late winter weather has frequently created favorable conditions for underburning. There are opportunities to also consider early fall for prescribed underburning post-harvest unit, topographical, as weather and operational conditions allow. It is unlikely that all prescribed underburning units could be fall burned because the weather window for successful implementation is usually very short, and does not even occur in some years.

Alternatives 2 and 3 would provide 374 and 143 acres, respectively, of complex early seral habitat. These acres include regeneration harvest, dominant tree release (DTR), and gaps. Migratory birds which favor shrub habitat in early seral conifer stands, such as the Rufous hummingbird and purple finch, would benefit for about 20 years or until dense conifer regrowth reestablishes in the units. Species, such as olive-sided flycatcher, which favor forest openings with large snags, would likely benefit for as long as the snags remain, which could be 30 or more years. Alternative 3 would have the same beneficial effects on migratory birds although fewer acres (111 acres) of gaps would be created and left unplanted.

Cumulative Effects

Alternative 2 and 3

The Goose project would be the first project to include any regeneration timber harvest in the project area since the early 1990s on FS lands, and no other regeneration harvest is reasonably foreseeable on the federal lands in this watershed. No complex early seral habitat has been created by wild fires in the project area in the past 50 years. A 38 acre fire burned in the 1970s, however it was mostly an understory burn that produced new snag habitat, but did not produce much early seral habitat. Two recently completed projects that included small gap treatments that benefit the above-discussed migratory bird species are the 13 Thin and Eagle Timber Sales of about 336 acres. Cumulatively, the proposed Goose project would provide early seral habitat in approximately three percent (Alternative 2), and approximately one percent (Alternative 3) of the 17,932 acre project area. An increase in seral dependent migratory birds would be expected in the regeneration and gap treatment units, and forest edges adjacent to the units, but the increase in birds would be minimal at the landscape level. The 18 percent of the project area that is private timber lands would likely continue to provide some lower-quality early seral bird habitat where stands have been recently clearcut.

No other projects that remove older forest habitat are reasonably foreseeable in this watershed or project area. With Alternative 2, viable populations of goshawks and other migratory birds that use older conifer forests are expected to be maintained at the landscape level because about 47 percent of the project area would remain older forested habitat over 200 years old. Alternative 3 would not modify any older forested habitat with the exception of the hazardous fuels reduction and prescribed natural fire stands. Those latter treatments would still maintain older forested habitats and provide overall benefits to the health of those habitats.

3.6 Botany and Invasive Plants

3.6.1 Summary of Effects Analysis

There would be no adverse effects on botanical resources from proposed actions. Sensitive species and special habitats in the area would be protected with no-disturbance buffers. Project design features would be used to mitigate any introduction of invasive plants.

3.6.2 Scale of Analysis

The scale of analysis for botanical resources is limited to the treated units.

3.6.3 Affected Environment – Sensitive Botanical Species

Current management direction mandates conservation of several categories of sensitive plants on the Willamette National Forest. Sensitive species are protected by USDA Forest Service regulations and manual direction (FSM 2672.4).

Numerous sensitive plants on the Regional Forester’s Botanical Species list for the Willamette National Forest have potential to occur in the project area, which encompasses a wide range of western Cascade forest habitats. The project area was surveyed summer 2009, using intuitive controlled surveys, in which the surveyor traversed through the project area to achieve a representative cross section of all the major habitats and topographic features, looking for the target species while in route between different areas. When the surveyor arrived at an area of potential habitat, which was defined in the pre-field review or encountered during the field visit, a complete survey for the target species was made. Surveys found no listed sensitive botanical species in the project area.

3.6.4 Environmental Consequences – Sensitive Botanical Species

Direct, Indirect and Cumulative Effects

Alternative 1, 2 and 3

Surveys performed in 2009 indicated no listed sensitive botanical species occur in the project area; therefore, no direct, indirect or cumulative effects are expected to occur from Alternative 1, 2 or 3.

3.6.5 Affected Environment – Survey and Manage Botanical Species

Survey and Manage species are old growth associated species that are genuinely rare or because of lack of information about them, the agencies do not know if they would be adequately protected by other elements of the Northwest Forest Plan. The complete list of Survey and Manage species that have potential habitat within the project area is in the Botanical Resource Report which is located within the project file and is available upon request.

The project area was surveyed summer 2009, using intuitive controlled surveys, in which the surveyor traversed through the project area to achieve a representative cross section of all the major habitats and topographic features, looking for the target species while in route between different areas. When the surveyor arrived at an area of potential habitat, which was defined in the pre-field review or encountered during the field visit, a complete survey for the target species was made. Surveys found three Survey and Manage lichens in the project area:

- *Nephroma occultum* can be found in old growth and younger forests of Douglas fir and western hemlock below 3000 feet elevation. It is usually seen on branches fallen from high in the canopy, but found growing near the forest floor where the forest is somewhat open. It is threatened by loss of old-growth habitat and microclimatic changes brought on by nearby logging, changes in understory humidity, insect defoliation, and fire.

- *Peltigera pacifica* grows on soil, moss, rocks, logs, and tree boles in moist forests from low elevations to about 2,200 feet. At higher elevations, it is found in creek draws and on forested lake shores. It is threatened by narrowing of riparian buffers.

- *Usnea longissima* occurs in old-growth and late-successional conifer stands, hardwood stands, and riparian areas where humidity is high. Forest management practices that harvest host trees may threaten existing populations.

Table 49 provides additional information about these lichen species and the units where they are located in the project area.

3.6.6 Environmental Consequences – Survey and Manage Botanical Species

Direct and Indirect Effects

Alternative 1 – No Action

No habitat modification would occur with selecting this alternative because no host trees would be removed and there would be no fragmentation as a result of timber harvest. The Survey and Manage populations documented in the project area would continue to exist while there is suitable habitat.

Alternative 1 may affect known populations of Survey and Manage lichens should the forest stand conditions deteriorate because of inter-tree competition where these species are found and the habitat can no longer sustain a viable population. The Survey and Manage species found in the project area all depend on old-growth conifer forests for suitable habitat. No-Action would eventually produce suitable habitat for these species, but without management the known populations may be extirpated before this occurs.

Alternative 2 & 3

The action alternatives would have no direct effect on Survey and Manage species because known sites would be buffered from harvest and ground disturbing activities. These buffers would maintain the microclimate, hydrology, and prevent damage to the areas during project implementation. Without the no-disturbance mitigation, reduced cover could potentially decrease humidity and increase temperature, thus altering microsite conditions conducive for Survey and Manage plant growth and vigor.

Habitat fragmentation is a conservation concern for sensitive lichen species in the project area. Many lichens have patchy distribution, even in suitable habitat, suggesting they have limited dispersal capability. Regardless of protection buffers, habitat fragmentation occurs naturally as trees die and canopy openings are created; as well as a result of timber management. The no-disturbance buffers are expected to serve as refugia for known sites and to maintain habitat for propagule dispersal.

Lichenologists do not have a clear understanding how smoke and atmospheric change affects lichens; but they know these plants are sensitive to such changes. These changes may affect reproductive vigor. Lichen populations in units proposed for post-harvest underburning could be at some risk of impacts from changes in air quality from fuels treatments (McCune & Geiser 1997). Higher than expected fire intensity from underburning may affect rare lichen species, but it is not likely to contribute toward federal listing of any species.

The 464 acres of skips in and adjacent to riparian area are expected to serve as suitable habitat for lichens dependent microsites associated with old growth stand and structure.

Table 49. Survey and Manage Botanical Species in the Goose Project Area

Proposed Unit	Survey and Manage Species	No-Disturbance Buffer
10, 130, 380, 830, 970	*Nephroma occultum*	90 ft.
330, 410, 550, 640, 960, 970, 980	*Peltigera pacifica*	60 ft.
240, 250/260, 830	*Usnea longissima*	180 ft.

Cumulative Effects

Alternative 1, 2 and 3

Effects to Survey and Manage species from actions proposed in the Goose project do not overlap in time and space with effects from any past, present or reasonably foreseeable future actions; therefore, the Goose project has no cumulative effects on Survey and Manage species.

3.6.7 Affected Environment – Sensitive and Survey and Manage Fungi Species

Sensitive Fungi Species

No surveys were required for fungi species in 2009 due to infeasibility of a single season and single year surveys (USDA Forest Service and USDI Bureau of Land Management 2004). Suitable habitat for these fungi does exist in the project area; therefore it is assumed that these species are likely to occur and could be impacted. A complete list of these species can be found in the botanical resource report on file at the McKenzie River Ranger District.

Survey and Manage Fungi Species

No surveys were required for fungi species in 2009 due to infeasibility of a single season and single year surveys (USDA Forest Service and USDI Bureau of Land Management 2004). Suitable habitat for these fungi does exist in the project area; therefore it is assumed that these species are likely to occur and could be impacted. A complete list of these species can be found in the *Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines*.

3.6.8 Environmental Consequences – Sensitive and Survey and Manage Fungi Species

Direct and Indirect Effects

Alternative 1

No effects to Sensitive or Survey and Manage fungi species would occur with Alternative 1, as no actions that could potentially affect these species would occur.

Alternative 2 and 3

Single surveys for fungi are not feasible, except for Bridgeoporus nobilissimus. Without knowing for certain the presence or absence of these fungi in the Goose planning area, a reasonable assumption is there would be some localized effects to individuals from activities proposed in the Goose FEIS. These actions may affect individuals, but they are not likely to contribute toward a trend requiring cause federal listing.

Effects to Sensitive and Survey and Manage fungi could occur from compaction, loss of host trees, and fuels treatments. Research has found fungal reproduction was not significantly affected at the 40 percent retention level, but was almost eliminated at the 15 percent retention level. (Luoma, et al. 2004). The Goose project proposes harvest under both action alternatives. However, Alternative 2 proposes treatments (i.e. regeneration harvest) that would reduce tree retention in some stands closer to the 15 percent threshold where effects to sensitive fungi have been observed.

Timber harvest could impact fungi in the planning area through soil compaction and microclimatic change by increasing the effects of solar radiation through canopy removal (Griffiths and Swanson, 2001). The gaps proposed in both alternatives would essentially have the same effect of regeneration harvest proposed in Alternative 2, but to lesser degree based on spatial impact. Alteration of seral stage creates a change in underground fungal species diversity and regeneration harvest does diminish the richness of ectomycorrhizal species (Byrd, et al., 2000). Logging intensity has also been shown to affect abundance and composition of ectomycorrhizal fungi (Durrall, et al., 2006).

Gaps could have additional effects on rare fungi species potentially occurring in the planning area by removing host trees of from their inoculum source. Ectomycorrhizal root tip density drops greatly when the distance from gap edge exceeds 10 meters (Berglund and Jonsson, 2003). No harvest areas (skips) would be retained in units with gaps and may allow for some level of mycelia retention. However, gaps greater than 10 meters (approximately 33 feet) from the next skip should be assumed to have some impact on fungi propagation.

Both natural fuels and post-harvest underburning have potential to affect Sensitive and Survey and Management fungi species. Research indicates diversity in ectomycorrhizal species, live root biomass, and duff levels are reduced by prescribed fire, compared to non-burned treatments (Smith, et al., 2005). It should also be noted, the majority of fungal species diversity resides in mineral soil (Bruns, et al., 2002). Considering, fire behavior can be unpredictable; effects could occur from a change in expected fire severity during under burning operations. As a consequence, high intensity fires may kill fungi in mineral soil (Dahlberg, 2002). The burn season would affect fire severity, with fall and spring burns having differential influences on the community structure and abundance of ectomycorrhizal fungi (Dahlberg, et al., 2001). Pile burning would likely have effects in terms of radiant heat impacts; since concentrated burning can result in localized higher fire intensities and changes in fungal species diversity (Baar, et al., 1999).

Cumulative Effects

Alternative 1, 2 and 3

Effects to Sensitive and Survey and Manage fungi species from actions proposed in the Goose project do not overlap in time and space with effects from any past, present or reasonably foreseeable future actions; therefore, the Goose project has no cumulative effects on Sensitive and Survey and Manage fungi species.

3.6.9 Affected Environment – Special Habitats

Special habitats are non-forested habitats that are limited in size and distribution across the landscape. Small, scattered habitats play important roles not only for full-time occupants of the sites, but also for those organisms who use them seasonally, or for only a portion of their life cycles. Numerous factors contribute to the creation or maintenance of special habitats. Among such factors, topography and hydrology often determine the microclimatic conditions at these sites. Some features, such as rock outcrops, are static and remain on the landscape. Wetland special habitats can be ephemeral or perennial depending on the water source. Meadows are unique because these features can be created by a natural disturbances and processes. Table 50 illustrates which special habitats occurs in units proposed for treatment in the Goose project.

Table 50. Special Habitats in the Goose Project Area

Units	Special Habitat	Buffer Distance*
5150, 90, 5750, 5750, 1550	seep/rock outcrop	60 ft.
5360, 400, 600, 680, 1030, 1330, 1950, 1940, 1930, 1360, 1320, 1280, 5610, 42, 420, 5230, 380, 640, 1060, 1030, 1460, 1920, 110, 5460, 5260, 1200, 1310, 1500, 1861, 1350	wetland/seep/swamp	60 ft.
5660, 1280	mesic meadow	60 ft.
5340, 150, 5450	vine maple talus	60 ft.

*No-disturbance buffer distance is based on Special Habitat Management Guide. Buffers would be expanded if Aquatic Resource Specialists deems them insufficient to maintain hydrologic function.

3.6.10 Environmental Consequences – Special Habitats

Direct and Indirect Effects

Alternative 1 – No Action

There would be no measurable effect to rock special habitats with selecting Alternative 1. These features are expected to persist on the landscape and it is assumed only natural weathering would change conditions at these sites. Alternative 1 may affect the meadow habitats in units 1280 and 5660 because it does not propose to harvest timber and would therefore not remove seed sources that contribute to encroachment.

Alternative 2 and 3

Alternative 2 and 3 would have no effect on special habitats. Special habitats would be buffered from harvest and ground disturbing activities which would protect and maintain the microclimate and hydrology, and prevent damage to the areas during project implementation.

Cumulative Effects

Alternative 1 – No Action

Effects to meadow habitat from actions proposed in Alternative 1 do not overlap in time and space with effects from any past, present or reasonably foreseeable future actions; therefore, Alternative 1 has no cumulative effects on meadow habitats.

Alternative 2 and 3

There would be no effect to special habitats in the project area with the action alternatives because of the no-disturbance buffer mitigation; therefore, there would be no cumulative effect from the proposed actions.

3.6.11 Affected Environment - Invasive Plants

Several populations of invasive plants are present in the project area. Plant species such as: St. John's Wort (*Hypericum perforatum*), Scotch Broom (*Cystisus scoparius*), Tansy Ragwort (*Senecio vulgaris*), Bull thistle (*Cirsium vulgare*), Himalayan Blackberry (*Rubus armenicus*), cutleaf blackberry (*Rubus lacinatus*), and spotted knapweed (*Centaurea strobe*) are found along roads within and adjacent to the project area. With the exception of spotted knapweed, these weeds are considered "established invaders" because they are commonly found on adjacent properties and throughout the Willamette National Forest. Spotted knapweed and false brome (Brachypodium sylvaticum) are considered "new invader" species because their distributions are limited in the Forest and they have greater potential for spread.

In the project area false brome is mainly found on road shoulders, but it is in some proposed harvest units. Similar management actions in the Foley Ridge area have contributed to the 519 acres of false brome currently found in Horse Creek watershed, which is adjacent to the Upper McKenzie watershed. Consequently, it is assumed that false brome would likely become established in all suitable habitats adjacent to established populations.

Grasses and forbs are often the first plants to colonize early seral habitats, with shrubs and trees becoming established later as the stand mature. Though less palatable than native forage, false brome is browsed, and then passed through manure. The seed can also get embedded in their fur. Most foraging wildlife species cover large areas, as such, there is potential to spread invasive plants throughout their respective range. See Table 51 for invasive plants in the project area.

Table 51. Invasive Plants in the Goose Project Area

Invasive Species	Proposed Unit
False brome (*Brachypodium sylvaticum*)	80, 90, 110, 180, 210, 240, 250, 260, 380, 390, 440,450, 460, 480, 540, 550, 570, 580,610, 620, 640, 650, 660, 690, 700,710, 720, 730, 740, 750, 760, 770, 900, 910, 920, 981
Spotted knapweed (*Centaurea maculosa*)	40, 660
Herb Robert (*Geranium robertianum*)	260, 830, 890
Reed Canarygrass (*Phalaris arundinacea*)	250, 830

Invasive Species	Proposed Unit
Blackberry species (Rubus armenicus/R.lacinatus)	290,400, 390, 840, 1490, 1861, 410
Deadly nightshade (*Solanum dulcamara*)	260
English ivy (*Hedra helix*)	260, 370, 530, 830
Deptford pink (*Dianthus armeria.*)	40, 460

3.6.12 Environmental Consequences – Invasive Species

Direct and Indirect Effects

Alternative 1 – No Action

There would be no effects to invasive plants with Alternative 1. Invasive plant populations would likely continue to spread at the current rate. Selecting this alternative would not create disturbed areas as a result of harvest, hauling, or fuels treatment activities.

Because Alternative 1 does not propose thinning, temporary road construction, or fuels treatments it would not create additional suitable habitat in terms of soil disturbance, temporary roads, gaps, or landings. However, natural vectors (i.e. wildlife and wind) would continue to spread invasive plants. New and potential invader plant populations documented in the project area would remain highest priority in receiving treatment and monitoring, as determined by the District Botanist.

Alternative 2 and 3

In most cases, invasive plant effects in this range can be minimized through proper inventory and project design. Since the majority of the Forest's invasive plant infestations occur along road shoulders, road maintenance and skid trails in harvest units represent a particular risk for inadvertently spreading weeds. Activities such as grading, brushing and mowing, culvert upgrades, and ditch cleaning can spread invasive plant species from one watershed to another.

Ground disturbance and habitat modification from project implementation would have an effect on invasive plants. It provides suitable conditions for invasive plants to establish or out-compete early pioneer native species. Ground disturbance from harvest would have an adverse effect on invasive plants because it creates disturbed areas. This effect would be observed for approximately 3-5 years on temporary roads and created openings (landings and gaps). This effect would diminish over time as native vegetation establishes and out-competes the non-native species. Often there are many other connected activities, such as road improvements and slash treatment that have a presence on the landscape and result in some degree of ground disturbance.

Based on the observed response of false brome to management in similar timber types, it is likely Alternative 2 could potentially spread false brome to 218 acres of early seral habitat above and beyond the commercial thinning acres; in addition to, 43 acres regeneration harvest. Regeneration harvest would leave 6-15 trees per acre depending on land allocation and would result in larger swaths of available ground for false brome establishment. False brome is known to establish along disturbed margins and spreads into adjacent habitats, invading successfully under a range of environmental conditions including shade and high nutrients (Holmes, et al. 2008).

It is assumed the 324 acres of regeneration harvest and gaps proposed under Alternative 2 would become likely infested. In order to mitigate the effect ground disturbance would have on invasive plants, temporary roads and landings would be re-vegetated using native grass seed. Off-road machinery would be washed prior to accessing and departing sale areas to mitigate the potential of vectoring invasive plant propagules. Rock sources used in temporary road construction would be free of invasive plants and approved by the road engineers and the District Botanist.

Cumulative Effects

Alternative 2 and 3

The cumulative effects analysis area for invasive plants is the project area because it addresses known distribution of invasive plants and likely travel routes for the proposed project. The invasive plants found in the project area are shade-intolerant and generally confined to roadsides and open areas, with the exception of false brome which in known to occur in some proposed harvest units. Eugene Water and Electric Board maintain a power line corridor that accesses parts of the project area. The vegetation management activities associated with the power line includes manual and mechanical treatments for invasive plants and is beneficial in reducing the effect of maintaining the infrastructure. The Goose project proposes 1,592 acres of timber harvest and 6.9 miles of temporary road construction. Twenty-one acres in Pass Thin will be harvested winter 2014-2015 under Categorical Exclusion with temporary road not exceeding 0.5 mile.

One past management action which has contributed to the current invasive plant condition is 1,100 acres of timber harvest from 1993 through the present. This includes implementation of projects analyzed in Foley Ridge and Bridge Thin Environmental Assessments. Temporary roads were constructed with these projects but they were re-vegetated and decommissioned after the activities were completed. Decommissioning and re-vegetation post-harvest was done to mitigate the effect of temporary roads by prohibiting vehicular access and establishing competing vegetation. Based on plant observations in similar habitats, native vegetation generally returns to a previously disturbed area within 2-5 years. Competitive seeding reduces the amount of resources available to invasive plants and the amount of time it would take for native plants to colonize a site.

Invasive plants are spread by many vectors and at least one species can be found on any given road within the project area. The project area currently includes approximately 82.4 miles or 602 gross acres of Forest, county, State, and private road (one road mile equals 7.3 acres, based on 30 feet distances from center line). Based on personal knowledge of the Goose, Foley Ridge and Bridge Thin projects, invasive plant populations are mainly confined to roads and landings.

Unlike managed stands and temporary roads, permanent roads persist as long as the infrastructure is needed and tend recover slower than other sites due to disturbance and usage patterns. The Goose FEIS does not propose permanent road construction; therefore the project would not add on to the existing gross acreage of invasive plants found along roads. Though difficult to quantify, competitive seeding is effective at mitigating the effect of temporary roads on invasive plants; but it assumed there would be some new invasive plant establishment because native seed viability and germination rates vary.

It is not known exactly how much of the 1,121 acres previously harvested is infested with invasive plants. In a managed stand, the effect of harvest on invasive plants is greatest at the onset when light and soil resources are most available and decreases over time as canopy cover and native plant competition increases. Depending on site productivity, the recovery time for a managed stand to sufficiently to shade out invasive species may take up to 20 years or more because trees grow slower than forbs and shrubs. Design features such as pressure washing implementation equipment, using rock sources free of invasive plants, and minimizing soil disturbance by using existing skid trails are effective mitigation measures and lessen the effect of spreading invasive plants as a result of harvest. Experience with past timber projects indicates invasive plants would likely become established in some of the harvested units, but it is not known for certain the acreage that would be infested.

In summary, timber harvest and related activities have contributed to the current condition of invasive plants, but they are not solely responsible since wildlife is a known vector of invasive plants. Not counting active sales, most temporary roads from previous harvest have been re-vegetated and decommissioned, so they do not currently exist on the landscape. The effect of constructing 6.9 miles of temporary road analyzed in the proposed action would be of the greatest intensity during implementation, but the duration of these effects should be lessened over time and with the design features.

The proposed action would add 1,592 gross acres of potential invasive plant habitat in addition to the existing 1,121 acres from past management; however the infested net acreage is not known. Project design features would mitigate most of the human-caused effects (i.e. harvest and roads) from implementing the project, but it is not possible to totally prevent invasive plants from spreading. Aside from variability in seeding and germination, harvest units with prescriptions that promote early seral vegetation are likely to attract foraging wildlife which could spread invasive plants to these areas.

3.7 Roads and Access

3.7.1 Summary of Effects Analysis

Alternative 2 would have approximately 6.9 miles and Alternative 3 would have approximately 2.2 miles of temporary road built within the project area. Implementation of either action alternative would result in a temporary increase of potential sediment delivery due to additional miles of temporary roads and increased traffic to access the treatment stands. Temporary roads would be decommissioned once activities are completed and would not change road miles or access in the long term.

3.7.2 Scale of Analysis

The geographic scale used to assess direct, indirect and cumulative effects for Roads and Access includes the project activity units and the overall Goose project area.

3.7.3 Affected Environment

The project area includes approximately 58.5 miles of forest roads; approximately 13.5 miles of state highways; 5.4 miles of county roads; and an estimated 5.0 miles of private roads and driveways. The Forest road system in the project area includes 14.5 miles of collector roads, 44.0 miles of local roads and no arterial roads. Highway 126 and 242 serve as arterial roads in the project area.

In and near the project area, past management activities have provided the current network of forest roads, mainly from timber sales from Forest Service and private timberlands. The current road system provides access to conduct a wide variety of forest management and fire protection activities in the area. Specifically, the forest roads provide access to Eugene Water and Electric Board power line and communication facilities, Lane County public disposal site “McKenzie Bridge” the McKenzie River National Recreation Trail, the Frissell Trail, McKenzie Bridge Campground, Paradise Campground, Limberlost Campground and various dispersed campsites. These roads also allow access for firewood and special forest products gathering.

Highways 126 and 242 bisect the planning area. Both are double lane roads paved with asphalt surfacing. Both of these highways are designated as Scenic Byways. Project activity units are located on both the north and south sides of the highway corridor. Roads 2633, 2638 and 2643 provide the primary access to the National Forest land within the project area.

30.6 miles of "key" forest roads identified in the Roads Analysis Report (USDA, 2003) occur in the project area. The Roads Analysis Report identified a need for these roads for long-term management of the Forest, and for access to recreation opportunities, administrative sites, and private lands. Key roads are the priority roads that are typically open to the public and maintained for vehicular traffic. They provide the long-term transportation network necessary to meet forest management objectives. Key roads and secondary roads are primarily surfaced with crushed rock.

Over the last decade, a limitation on road maintenance funds on the Forest has resulted in a backlog of maintenance work including road side brushing, culvert and drainage ditch maintenance and road surface repair on many of the key and secondary roads in the project area. Under Alternative 2 and 3, there are drainage improvements which would need to be implemented prior to commercial haul, to protect water quality. Many of the culverts on the roads are in poor condition or undersized, and are in need of replacement. Additional deferred maintenance is expected in the future unless maintenance budget funding is improved.

3.7.4 Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Alternative 1 would not change the use pattern of roads, or correct existing road maintenance problems. Without treatment-related road maintenance, the existing budgetary trend makes it unlikely that funding would be available to support adequate road maintenance. Brush and tree re-growth and associated reduced visibility, debris on road, and surface irregularities from off-highway vehicles (OHV) and other traffic could eventually result in unsafe traveling conditions for public and administrative traffic, as well as increasing resource damage associated with localized erosion. There is currently a backlog of road maintenance and some local roads are impassible due to fallen trees or brush encroachment. Culverts that are not maintained because of impassible roads may plug and cause washouts with sediment reaching into major drainages.

Alternative 2 and 3

Road Maintenance

Road maintenance would occur on 43 miles of road with Alternative 2 and 26 miles of road with Alternative 3. Road maintenance would protect the existing road infrastructure, improve safety of the road, and decrease sedimentation on roads used for project implementation. Road maintenance may include blading, ditch maintenance, culvert replacement, surface rocking, and/or installing dips or waterbars which would result in the proper drainage and safe use of the roads (see Design Features Table 13). Brushing roads would increase sight distance and increase visibility for safer driving. Removing ditch slough (accumulated soil) to predetermined disposal locations would reduce the likelihood of spreading invasive plants. There are miscellaneous segments, in both alternatives, of low standard roads identified as potential haul routes throughout the planning area that would require minor road width adjustments and road surface rehabilitation to support commercial haul.

Maintenance proposed with Alternative 2 and 3 may cause a temporary increase in sedimentation while the road maintenance work is being done (prior to treatments and associated road use), but would decrease the volume and velocity of water that carries sediments off roads afterwards. Newly graded or surfaced roads, improved drainage structures, and upgraded culverts may increase sediment production until road surfaces and slopes stabilize, typically within one to two seasons. Attention would be paid during road maintenance activities to minimize potential delivery to adjacent streams and Best Management Practices (BMP) would be applied to prevent sedimentation to the greatest extent. Designated water sources for filling water tankers for surface blading, compaction and dust abatement operations would be administered so as to not adversely affect stream flows.

Alternative 3 would maintain less miles of road than Alternative 2 because it would have less haul routes associated with these activities. The use of fewer roads in the project area may continue the backlog of needed road maintenance activities. The number of miles open to public access would remain unchanged. Maintenance activities would cause some short-term delays or detours for road users while roadwork is being performed. All OHV use on roads currently open to mixed use (approximately 24.9 miles in Alternative 2 and 11.1 miles in Alternative 3would be restricted while treatment activities are taking place.

To address the identified concerns along Road 2600275 regarding the potential for both Glenn Creek and Goose Creek stream crossings becoming blocked with debris or relocated bed load, causing channel migration, the following design features would be implemented prior to harvest activities:

- During road reconstruction the existing road geometry including roadbed width, cross slope, horizontal and vertical alignment and grades would require adjustment to improve driver safety, create a safe distance between the current roadway and existing power poles, improve drainage and road surface runoff.
- The stream crossings would be designed to pass 100 year flood flows. This would incorporate the design and construction of an armored ford/dip in Glenn Creek and the replacement of the existing culvert in Goose Creek with an armored ford/dip or culvert structure.

Temporary Spur Roads

Alternative 2 and 3 require construction of temporary spur roads. Alternative 2 would have approximately 6.9 miles and Alternative 3 would have approximately 2.2 miles of temporary roads built within the project area. Implementation of either action Alternative would result in a temporary increase of disturbance due to additional miles of temporary roads and increased traffic to access the treatment stands. All temporary roads would be decommissioned once activities are completed and would not change road miles or access in the long term.

Portions of the original road system were constructed to accommodate large towers that were used to log large tracts of land. Current thinning activity usually utilizes small, mobile, road-based yarders. Temporary spur road construction has been kept to a minimum in both action alternatives, utilizing the existing transportation system, skid trails and previously disturbed areas wherever possible. New temporary roads would typically be located to use gentle slopes and minimize soil disturbance wherever possible.

Upon completion of all project activities, the open road density within the project area would not change. The open road density of Forest Service roads would remain approximately 1.7 miles per square mile. All currently closed system roads (approximately. 0.20 miles) that would be re-opened and utilized for timber haul would have maintenance performed prior to any haul. Upon the completion of project activities, these roads would then be physically blocked to traffic. All roads treated would be left in a hydrologically stable condition to drain properly and protect water quality. Future road maintenance costs would be reduced because roads would be re-closed to traffic and left with self-maintaining water drainage features.

Cumulative Effects

Past management actions have created 58.5 miles of Forest Service road system within the project area that require continuing road maintenance to provide adequate safe use and resource protection. Past budgets have resulted in maintenance rates that have led to a decline in road conditions across the project area. Alternatives 2 and 3 would provide necessary road maintenance on the haul routes and roads used for other treatment activities. Maintenance proposed under these alternatives, combined with the maintenance that occurred with the 13 Thin Timber Sale and Eagle Timber Sale (past projects overlapping project area) would continue to improve the road system, reducing sedimentation and increasing safety.

3.8 Heritage Resources

3.8.1 Summary of Effects Analysis

No effects are expected for activities associated with Alternative 1, 2, or 3. Areas previously identified as culturally sensitive, and areas identified during surveys as culturally sensitive have been avoided by either dropping the proposed unit or redesigning the unit boundary. Additionally areas which could become identified during implementation are covered by protection measures are already in place for this project (see Design Features Chapter 2).

3.8.2 Scale of Analysis

The geographic scale used to assess direct, indirect and cumulative effects for heritage resources includes the project's active units, road construction, landings, and hazardous fuels activities within the Goose project. An archaeological survey of the Goose project was conducted in order to comply with Section 106 of the National Historic Preservation Act (NHPA) and other relevant laws and regulations. A systematic surface pedestrian search is the principal manner for implementing the mandated goals.

3.8.3 Assessment Methodology

An archaeological survey of the Goose project was conducted in 2009. A systematic surface pedestrian search was the principal manner for implementing the above stated mandated goals. The field survey of Goose project was performed by ten crew members, utilized on different days, from early May to mid-July 2009 following the Willamette National Forest Cultural Resource Inventory Plan guidelines. Pedestrian transects spaced at 15 to 20 meter intervals followed a specific orientation based on factors that included the shapes of units and landforms and the possible presence of historic, Indian or Euro-American travel routes. One-by-one meter shovel scrapes made with entrenching tools exposed mineral soil every 20 to 30 meters in areas where dense vegetation limited ground visibility. Bearing orientations were followed to the best of abilities, but adjustments in orientation, spacing intervals, and shovel scrape spacing were made in order to avoid dangerous or unreasonable conditions (e.g., exceptionally steep slopes or impenetrable vegetation). Approximately 1650 acres were surveyed consisting of about 1350 high probability and 300 low probability acres.

3.8.4 Affected Environment

There are 31 cultural sites recorded within the project area that are considered eligible or potentially eligible to the National Register of Historic Places (NRHP) and must be protected from all ground disturbing project activities or evaluated to determine their eligibility to the NRHP. Four of these sites were previously located and monitored under this project and six cultural sites were newly discovered during the survey.

The prehistory and history of the McKenzie River drainage have previously been summarized in the Cultural Resource Overview for the Willamette National Forest, Western Oregon (Minor and Pecor, 1977) the ten-year update of the above overview (Minor et al., 1987), Prehistory and History of B. L. M. Lands in West-Central Oregon: A Cultural Resource Overview (Beckham, Minor, and Toepel, 1981) Archaeology of Oregon (2nd Edition) (Aikens, 1986), McKenzie River Valley History (Williams, 1988) and numerous other publications.

Cultural History

Ethnographic research indicates that highly mobile prehistoric and early historic Indian groups, probably the Molala, Kalapuya, and their ancestors used the western Cascade Mountains for the main purposes of seasonal hunting, fishing, and plant gathering. Ethnographic evidence also suggests that the Molala Indians were indigenous to the area and lived during the winter along low elevation streams, accessing the uplands during the summer and fall to hunt game and gather berries and other important plant resources. The Molala are linguistically related to Willamette Valley groups, but are thought to be composed of montane-based bands who were living in the western Oregon Cascades during the historic period.

The first recorded contact between the Indians and European trappers and settlers came in 1812 when members of the Pacific Fur Company under the leadership of Donald McKenzie (for whom the river and valley are named) entered the area (Williams 1988). Unfortunately, Indian contact with trappers, missionaries, military expeditions and settlers also brought them into contact with European diseases such as smallpox and influenza, which decimated their populations.

By the mid -1800s many of the remaining Molala and Kalapuya were removed to the Grand Ronde Reservation in western Oregon after the signing of the Dayton and Molala Treaties of 1855. Other Molala shifted to the Siletz Reservation along the Oregon coast, the Klamath Reservation to the south and to the Warm Springs Reservation in eastern Oregon where they were absorbed into the Confederated Tribes of Warm Springs.

Pre-contact Indian use in the area is reflected in the cultural material they left behind including chipped obsidian lithic scatters and obsidian lithic isolates, representing tool use, modification, or manufacture related to hunting and gathering. These sites are protected through avoidance from project activities.

Historic use of the project appears mainly in the form of trails which functioned as a part of the administrative and communication network in the early days of the Forest Service. Pre-field research uncovered six historic features that exist within or in close proximity of the project boundaries. Of these six features, three are trails, two are roads, and one is a forest camp. The trails are Foley Ridge Trail, Frissell Point Trail, and an unnamed trail, the roads are the Deschutes Wagon Road and Scott’s Road, and the forest camp is the Limberlost Forest Camp (used today by forest visitors).

3.8.5 Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Implementation of the No-Action alternative would have no direct or indirect effect on cultural resources since there would be no change to the integrity of cultural resource sites.

Alternative 2

Timber harvest, new and temporary road construction, ground base and skyline yarding and post-harvest fuels treatment would be greater under this alternative producing an increased amount of ground disturbance. Ground disturbance can affect the surface and subsurface integrity of an archaeological site and thus its significance to the National Register of Historic Places. Since appropriate and approved surveys have been conducted and cultural site protection measures would be in place (see Table 13), the potential direct effects to all other potentially eligible sites would be in the form of inadvertent damage to the integrity of the cultural resources which were not discovered during initial survey. Any sites uncovered during implementation of the project would require all earth-disturbing activities in the vicinity of the find to be suspended, in accordance with federal regulations, and the zone archaeologist notified to evaluate the discovery and recommend subsequent courses of action. Therefore, contract clause BT6.24 (or its equivalent) must be included in all project prospecti and contracts. The contract clause outlines the procedures to follow in the event cultural resources are discovered during timber sale operations.

Alternative 3

Implementation of Alternative 3 would result in 982 less acres of ground disturbance due to timber harvest, 4.7 less miles of ground disturbed from temporary road construction, 299 less acres of under burning slash and fire line construction, and 315 acres less of pile and burn slash Based on these numbers, Alternative 3 would result in less ground disturbance from harvest thinning activities and thus less potential for inadvertent damage to the integrity of cultural resources which were not discovered during initial survey. Since appropriate and approved surveys have been conducted and cultural site protection measures are already in place (see Design Features, Chapter 2, Table 13), the potential direct effects to all other potentially eligible sites would be in the form of inadvertent damage to the integrity of the cultural resources which were not discovered during initial survey. Any sites uncovered during implementation of the project would require that all earth-disturbing activities in the vicinity of the find to be suspended, in accordance with federal regulations, and the zone archaeologist notified to evaluate the discovery and recommend subsequent courses of action. Therefore, contract clause BT6.24 (or its equivalent) must be included in all project prospecti and contracts. The contract clause outlines the procedures to follow in the event cultural resources are discovered during timber sale operations.

Therefore, no adverse effects are anticipated from either Alternative 2 or 3 due to the avoidance of known cultural resources and the application of timber sale contract clause BT6.24 (or its equivalent).

Cumulative Effects

Alternative 2 and 3

Previous impacts to the area have mainly included road construction, timber harvest activities and wildfires. Timber harvest and the associated road/landing building have been the primary recent activities shaping the Goose project landscape. There has been approximately 3055 acres of harvest on federal grounds within the project, and 72 percent of the treatments have been regeneration harvests occurring prior to 1994. The earliest clearcut was harvested in the 1940’s. Some of these stands have since received thinning and some have not.

Over the past 100 years, records indicate four large wildfires within the project area ranging in size from 480 to 1,715 acres. Additionally, since 1970, records indicate there has been approximately 69 smaller, low to moderate severity fires within the project area ranging in size from .1 to 38 acres.

Some of the above activities exposed cultural sites and damaged some of the integrity of some of the known sites within the project area. Based on past archaeological excavation work, we do know that the extent of damage from timber sale harvest usually occurred at a depth of 20 to 40cm. Most of the timber sale harvest damage to cultural sites occurred during actions undertaken by the Forest Service prior to the President signing Executive Order 11593 and implementation of Section 106 of the National Historic Preservation Act (NHPA) of 1966 (See Affected Environment). During this period prior to the mid to late 1970s, the Forest Service was not required to hire professional archaeologists to conduct cultural resource surveys. Thus few sites were known on the Forest. If cultural sites are discovered during the current Goose project then project activities would be suspended in the area of the find, until the archaeologist can determine the extent of the damage and determine further course of action if necessary.

Based on a review of the past, present and foreseeable projects listed in Appendix D, there are no additional cumulative effects anticipated to occur to the known cultural sites from any of the proposed actions under the Goose project since appropriate and approved surveys and cultural site protection measures are already in place for this project (see Design Features, Chapter 2, Table 13).

3.9 Scenic Quality

3.9.1 Summary of Effects Analysis

Alternative 1 would have no adverse effect on scenic quality because no harvest treatments would occur under this alternative.

Alternatives 2 and 3 would not have long term adverse effects to scenic quality however short term adverse effects to Frissell Trail would occur. These effects would be minimized by design features and would gradually fade over time as vegetative recovery takes place. Overall, the proposed activities are expected to result in a more visually interesting forest structure, increased depth of view into the forest, and a more diverse mix of vegetative species. The proposed actions would have no long term adverse effects to visually sensitive management areas and proposed treatments would be consistent with Forest Plan standards and guidelines.

3.9.2 Scale of Analysis

The geographic scale used to assess direct, indirect and cumulative effects for Scenic Quality is the McKenzie viewshed within the project area.

3.9.3 Affected Environment

The Goose project area lies within the McKenzie viewshed corridor. This viewshed is an important visual corridor as it is adjacent to multiple travel corridors that are considered sensitive to scenic quality. Two National Scenic Byways pass through the project area; the West Cascades National Scenic Byway and the McKenzie Pass-Santiam Pass National Scenic Byway. Portions of the McKenzie River, a designated State Scenic Waterway and Forest Special Interest Area (SIA), pass through the project area between Belknap hot springs and the McKenzie Bridge Campground. Portions of the McKenzie River National Recreation Trail (4.5 miles) and Frissell Trail (5.5 miles) are within the project area.

Visual Management System

The Visual Management System (VMS) is the primary means for planning and management of the Willamette National Forest's scenic resources. The VMS was used to inventory and categorize Forest landscape zones of relative scenic importance in the Forest Plan. The zones were based on attractiveness, proximity to travelways and use areas, and the concern Forest users have for scenic quality. These zones were then assigned one of five Visual Quality Objectives (VQOs) that represent relative degrees of acceptable alterations of the natural landscape. The VQOs for the Goose project area include retention, partial-retention and maximum modification. These VQOs are illustrated in Figure 33 and 34 and described in detail in Table 52.

Scenery Management System

The Scenery Management System (SMS) is an updated methodology (1996) used by the Forest Service to provide a visual impact assessment of effects to the scenic resources which integrates social impacts to recreation visitors with physical impacts to the visitor experience. SMS objectives are described in terms of Scenic Integrity Levels which describe existing conditions and whether the landscape is visually perceived to be "complete" or not.

While the current Forest Plan is tiered to the VMS system, the SMS has also been used in this analysis to facilitate this change in methodology. Table 52 describes the five VMS/VQO categories, associated SMS categories, and the proposed treatment acres in each category with Alternative 2.

Table 52. VMS and SMS Objectives and Proposed Treatment Acres in Alternative 2

VMS (SMS) Category	Visual Quality Objectives (VMS)	Scenic Integrity Levels (SMS)	Proposed Treatment Acres in Alternative 2
Preservation (very high)	Provides for ecological change only	Landscape character is intact with only minute if any deviations. The existing landscape character and sense of place is expressed at the highest possible level	Timber Harvest: 0 Fuels Treatments: 0
Retention (high)	In general, human activities are not evident to the casual forest visitor	Landscape character appears intact. Deviations may be present but must repeat the form, line, color, texture and pattern common to the landscape character so completely that and at such a scale that they are not evident.	Timber Harvest: 664 Fuels Treatments: 283
Partial Retention (moderate)	In general, human activities may be evident but must remain subordinate to the characteristic landscape	Landscape character appears slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed	Timber Harvest: 1033 Fuels Treatments: 113
Modification (low)	Human activities may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture, and appear as natural occurrence when viewed in foreground or middle-ground distances.	Landscape character appears moderately altered. Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles outside the landscape the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within.	Timber Harvest: 0 Fuels Treatments: 0
Maximum Modification (very low)	Human activity may dominate the characteristic landscape but should not appear as a natural occurrence when viewed as background.	Landscape character appears heavily altered. Deviations may strongly dominate the valued landscape character.	Timber Harvest: 357 Fuels Treatments: 0

3.9.4 Environmental Consequences

The analysis methods used to evaluate the effects of the alternatives on scenery were based on a review of the Forest Plan for consistency with standards and guidelines applicable to the management areas and related visual quality objectives (VQO) in the Goose project.

Direct and Indirect Effects

Alternative 1 – No Action

Scenic quality in the project area would continue to be unaffected by timber harvest under Alternative 1 because no treatments are proposed under this alternative. Natural processes would continue unaffected by management actions and the potential benefits of timber harvest to scenery would not be realized. Short term adverse effects to scenery associated with timber harvest activity to Frissell Trail would not occur. Alternative 1 would have no direct or indirect effects on scenic quality in the project area and all VQO's would remain consistent with Forest Plan direction.

Alternative 2 and 3

Thinning harvests and intermediate harvest treatments, including fuels treatments would result in larger diameters and crowns of residual trees due to increased growing space and are expected to accelerate stand development toward a more natural range of conditions and would increase scenic diversity in the project area. Proposed openings (gaps) would be placed to mimic natural openings, and where possible, placed adjacent to natural features such as meadows or rock outcrops. Opening perimeters would be in shapes that respond to the natural landscape. Gap size and cumulative acreage of gaps within management areas would meet standard and guidelines for timber management as identified in the Forest Plan. Harvest unit boundaries would be blended (feathered) and would be designed with the visual landscape in mind to minimize straight lines and follow contours and natural features. When possible, temporary roads would be designed to blend into surrounding topography. Hazardous fuels treatments in visually sensitive areas would result in a natural appearance and help to improve the depth of view into the forest.

For those visitors traveling the forest road system through or adjacent to harvest units in the project area, short term direct effects to visual quality would be limited to dust and possibly noise from transporting forest products on unpaved forest roads. After harvest treatments exposed stumps and slash piles would be noticeable but would fade as vegetative recovery takes place. Benefits to scenic byways include less dense forest stands providing increased depth of view into the surrounding forest, larger size of remaining trees and richer mosaic of tree and vegetation diversity.

Boaters on the McKenzie River have a similar viewing corridor as highway travelers because the road roughly parallels the river. Both travel corridors are considered important travel routes where viewing scenery may be a key component of the visitor experience. The predominance of dense forest along the river banks and a recessed field of view (deeply incised river channel) restricts visibility into the project area even more so than from the highway. Visible harvest areas would be predominantly thinning or fuels units with a high percentage of canopy retention and these units would be viewed at middle-ground distances (.5-4 miles) where the degree of discernible detail is low.

Short term impacts to scenery along Frissell Trail would include exposed stumps and slash piles however these potential impacts would be mitigated by design features which would require a 50 foot no harvest buffer on either side of the trail, and removal, mastication or burning of slash piles within 100ft. of the trail. Tree marking would be required to be placed on the side of trees facing away from the trail and boundary markers within 100ft. of the trail would be removed after project implementation. Trail buffer marking would be minimized to the extent possible. The trail head parking area would be used as a landing site and exposed stumps, slash piles, marked trees, log piles and equipment tracks would be noticeable in the short term after harvest activities but would be subject to the same design features for the trail and are expected to be largely unnoticeable when vegetative recovery takes place.

Three units (471, 691, and 720) are proposed for regeneration harvest in Alternative 2. Unit 471 is located down slope from Frissell Trail and would likely be visible, though partially screened by vegetation. Due to its location lower on the slope; it's meandering, more natural appearing edge; and relative size for the management area and location; it is expected to meet retention. Unit 691 and 720 are categorized as maximum modification. All units proposed for regeneration harvest would conform to timber management objectives for individual unit size and overall percentage of regeneration harvest permitted within the management areas where they are proposed. No regeneration harvest would occur in Alternative 3.

Two hundred fifty-one acres of WUI treatments are proposed within the McKenzie River SIA under Alternative 2. The proposed treatments would not adversely affect the exceptional or unusual scenic characteristics that contribute to this areas unique character. Fuels reduction treatments consist of thinning underbrush and ladder fuels (branches and smaller trees) and are consistent with Forest Plan direction (MA-5a-09) to suppress wildfires at the lowest acreage practicable in SIA's. Fuels reduction treatments would be consistent with the management objective to reduce the severity of wildfires in the wild land urban interface and accomplish enhancement program goals to actively manage stands to reduce the potential for undesirable stand replacing fires (McKenzie River Special Interest Area Implementation Guide). No harvest activities are proposed within the SIA.

Overall, the proposed activities are expected to result in a more visually interesting forest structure, increased depth of view into the forest, and a more diverse mix of vegetative species. The proposed actions would have no long term adverse effects to visually sensitive management areas and proposed treatments would be consistent with Forest Plan standards and guidelines. Design features are included in Chapter 2 to ensure Visual Quality Objectives and Scenic Integrity Levels as described in Table 54 are maintained.

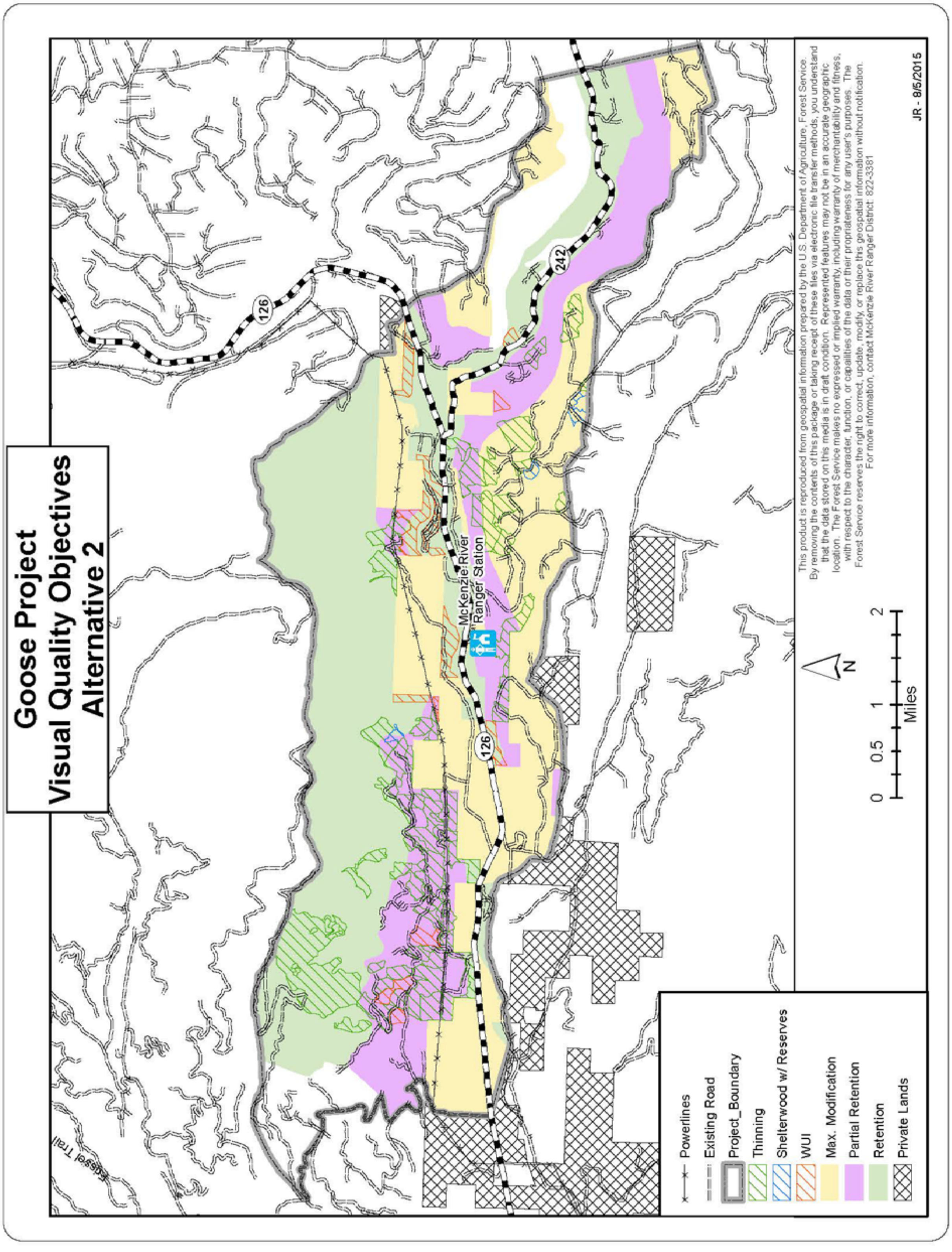

Figure 33. Visual Quality Objectives Alternative 2

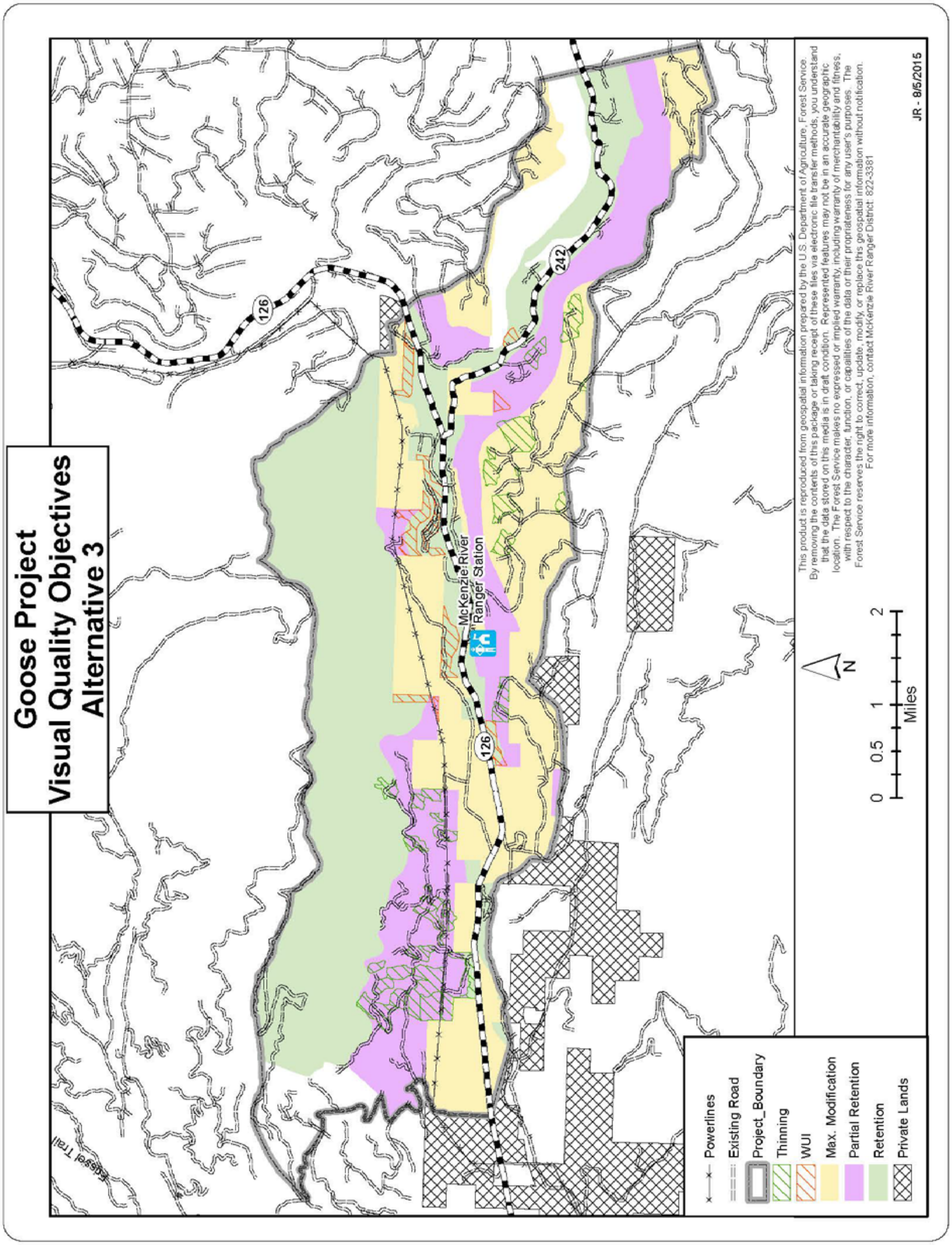

Figure 34. Visual Quality Objectives Alternative 3

Cumulative Effects

Alternative 1

No direct or indirect effects would occur under Alternative 1; therefore, no cumulative effects would occur under Alternative

Alternative 2 and 3

Past and present natural and human caused disturbances or modifications (including fire, disease, timber harvest, fire suppression, prescribed fire treatments, power line corridors, a golf course, residence/business development, and road development) are visible within and adjacent to the project area. From 1993 to present, approximately 764 acres in the project area have been harvested, however vegetation has regrown in the majority of these previously harvested areas so no long-term adverse incremental cumulative effects to scenic quality are anticipated.

3.10 Recreation

3.10.1 Summary of Effects Analysis

Alternative 1 would have no direct, indirect or cumulative effects on recreation. Alternative 2 and 3 would have temporary adverse effects due to trail closures, increased noise and dust and log truck traffic during harvest activity. Benefits of timber harvest activity would include improved access to dispersed recreation areas due to road maintenance, improved scenery from secondary forest roads and an enlarged and improved trailhead parking area at Frissell Trail.

3.10.2 Scale of Analysis

The geographic scale used to assess direct, indirect and cumulative effects to recreation is the Goose project planning area which includes the project activity units and those portions of Florence Creek-McKenzie River, Elk Creek-McKenzie River and Lost Creek 6th Field watersheds.

3.10.3 Affected Environment

The project area is popular for both developed and dispersed recreation activities including: camping, hiking, hunting, fishing, bicycling, boating, picnicking, berry picking, viewing scenery, and driving for pleasure. Portions of the West Cascades National Scenic Byway and McKenzie Pass-Santiam Pass National Scenic Byway are within the project area. The forested slopes along the McKenzie River (a portion of which is designated Oregon State Scenic Waterway) form an important scenic backdrop for the byways and river corridor.

Visitor use in the project area is largely driven by river-dependent recreation activities. Commercial and private non-motorized boating opportunities (i.e., kayaks, rafts, and drift boats) are extremely popular. Several developed boat launches provide river access and/or day use facilities like picnic tables, restrooms and garbage service. Seasonal fishing (from the bank and/or boat) is very popular with local residents and visitors. Hiking and mountain biking are very popular activities on the McKenzie River National Recreation Trail. Several day use areas and interpretive sites along highway 126 and 242 provide opportunities to learn about the area, enjoy a picnic or go for a short hike on a developed trail. There are 48 special use permits for river and trail outfitter/guides within the project area as well as numerous recreation residences (summer homes).

Highway 242 is part of the McKenzie Pass-Santiam Pass National Scenic Byway and is a very popular route for scenic driving and road cycling. It is not uncommon to find the roads busy with individual or group road cyclists during the summer months. Those same cyclists also share the road with those choosing to enjoy the scenery from the comfort of their car.

Overnight camping occurs in many places and in many forms in the project area including at unmanaged dispersed campsites and at developed campgrounds or resort style private accommodations (Figure 35).

Recreation Opportunity Spectrum (ROS)

The Forest Service uses a land classification system to inventory and describe a range of recreation opportunities called the Recreational Opportunity Spectrum (ROS) from the Willamette Forest Plan FEIS, page III-93. This system seeks to identify recreation settings of varying characteristics that range from remote, undeveloped areas to easily accessed highly developed sites. Settings are described in the following five ROS Classes: Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Natural, and Roaded Modified. Primitive falls on the most unmodified natural environment end of the spectrum and Roaded Modified falls on the most substantially modified end of the spectrum. Table 53 displays the ROS classes and treatment acres for each alternative within the project area. Table 54 displays ROS allocations and desired conditions.

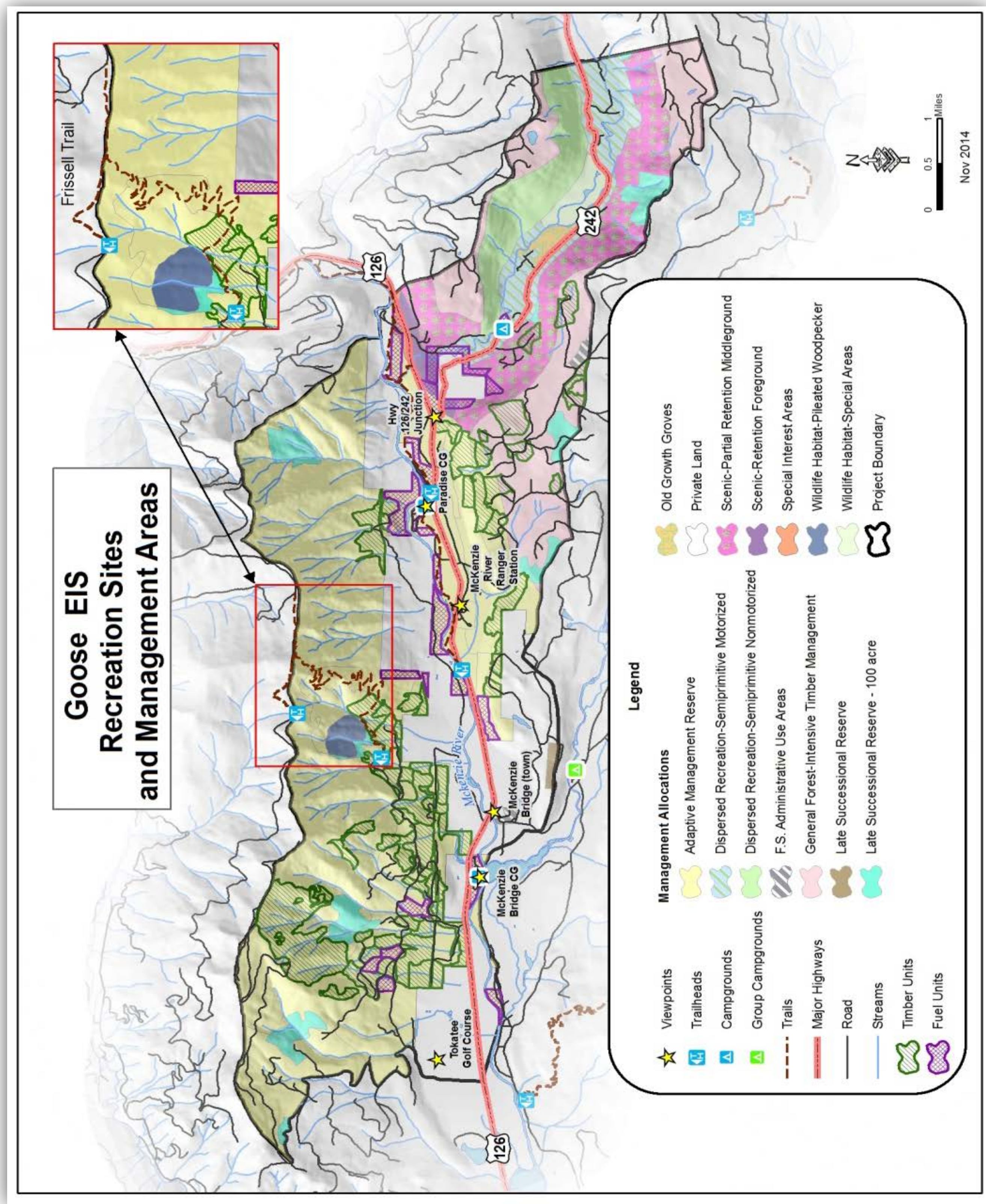

Figure 35. Recreation Sites and Management Areas in Goose Project Area

Table 53. Management Areas and ROS Allocations Goose Project

Management Allocation (MA)	ROS Allocation	Acres in Alternative 2 Treatment Units	Acres in Alternative 3 Treatment Units
Matrix (MA 14A) – Max Modification	Roaded Modified	209	157
Special Interest Areas (MA 5A)	Roaded Natural	19	19
Special Interest Areas (MA 5A/17)	Roaded Natural	232	232
Matrix - Scenic Partial Retention Middleground (MA14A/MA11C)	Roaded Natural	44	44
Riparian Reserves (MA 15)	Roaded Natural	713	338
Adaptive Management Reserve (MA 17) – Scenic Partial Retention Middleground 11C	Roaded Natural	1,102	469
Adaptive Management Reserve (MA 17) – Scenic Middleground 11E	Roaded Natural	620	38
Adaptive Management Reserve (MA 17) – Scenic Retention Foreground 11F	Roaded Natural	63	31
Adaptive Management Reserve (MA 17) – Max Modification 14A	Roaded Natural	148	66
100-acre Late Successional Reserve (MA 16B) - Dispersed Recreation – Semiprimitive Motorized (MA 10C)	Semi-Primitive Motorized	15	15

Table 54. Goose Project Area ROS Allocation Summary and Desired Conditions

ROS Class	Treatment Acres	Desired Condition for setting	Desired Condition for Activities
Roaded Modified	Alt 2: 209 acres Alt 3: 157 acres	Opportunity to get away from others, but with easy access Environment will appear substantially modified Access and travel is conventional motorized vehicle Shape and blend vegetation alterations, foreground should be natural appearing	Access for people with disabilities is a moderate challenge Rustic facilities provide some comfort and site protection Moderate site modification can occur
Roaded Natural	Alt 2: 2,709 acres	Opportunity to affiliate with others but with some chance for privacy	Access for people with disabilities is difficult No on site facilities except occasional signing site

ROS Class	Treatment Acres	Desired Condition for setting	Desired Condition for Activities
	Alt 3: 1005 acres	Some obvious control of users Mostly natural appearing setting Vegetation modification done to maintain desired visual characteristics	modification by users
Semi-Primitive Motorized	Alt 2 and 3: 15 acres	Moderate probability of experiencing solitude, closeness to nature, tranquility. High degree of self-reliance, challenge and risk in using motorized equipment. Predominantly naturally appearing environment.	Access for people with disabilities is difficult. Rustic and rudimentary facilities primarily for site protection using native material.

Recreational Driving/Road Access

Driving for pleasure (sightseeing) is a popular activity within the project area, primarily during the summer months when roads are open and free of snow. There are two National Scenic Byways in the project area; the West Cascades National Scenic Byway and the McKenzie Pass-Santiam Pass National Scenic Byway. Visitors enjoying these routes will sometimes stop along their drive to picnic at one of several developed sites, visit interpretive sites, or choose their own special place to relax before continuing on their journey. In addition to scenic driving on byways, visitors also drive other Forest Service roads for pleasure; this use fluctuates from very light on most dead end roads to moderate use on secondary and connector roads, with increased use during the hunting season.

Off Highway Vehicle (OHV) use on the forest road system in the project area is not common because numerous higher quality riding areas exist on the district including the Santiam Pass Recreation Area which provides a designated OHV trail system that supports summer and winter OHV use.

The Lane County public transportation system services a daily bus route through the McKenzie River valley that terminates at the McKenzie River Ranger Station. Visitors can get within easy walking distance to some prime fishing spots and the McKenzie River National Recreation Trail for hiking and biking. The bus also provides limited bicycle transport, allowing mountain bikers and road cyclists an easy method of getting to their desired starting point.

Developed Recreation Sites

McKenzie Bridge, Paradise, and Limberlost are the three developed campgrounds within the project area. Paradise Campground is extremely popular and provides 64 campsites, a boat launch, McKenzie River trail access and a day use area with an amphitheater. McKenzie Bridge Campground is near the community of McKenzie Bridge and has 20 campsites, two day use areas and a boat launch. Limberlost Campground is a small campground on highway 242 and provides a more primitive experience with just 12 campsites along a small creek with restroom and garbage facilities.

Dispersed Camping

There are 15 known dispersed campsites within the project area. These sites are usually associated with favorite hunting areas or are areas with some interesting natural features such as fresh water streams, lakes, rock formations or an appealing forest environment. There are two high use campsites along

Highway 242 which provide access to Lost Creek and have an appealing forest environment with associated camping areas. The remaining sites are moderate to low use and are primarily in the more upland areas of the watershed and tend to be used by hunters during hunting season.

Trails

The entire McKenzie River National Recreation Trail (McKenzie River NRT) is 26 miles in length with an upper trail head near Clear Lake and lower trail head near the McKenzie River Ranger District office. The McKenzie River NRT provides multiple access points throughout its length at a variety of developed recreation sites and trailheads allowing for a wide variety of route and transportation options. Approximately 4.5 miles of the McKenzie River NRT are within the project area (Figure 38). The Frissell Trail is 5.5 miles in length and leads to Lookout Ridge and Frissell Mountain along the northern boundary of the project area. The entire trail is located in the project area, though only .85 miles are located in units proposed for treatment (Figure 38). Frissell Trail receives low use, while the McKenzie River NRT receives very high use and is nationally renowned for hiking and mountain biking.

Although a lower use trail, Frissell Trail is the closest trail to the community of McKenzie Bridge and because it is south facing the lower trail section remains accessible for a large portion of the year. Over time Frissell trail has deteriorated due to lack of maintenance but also due to narrowing trail benching due to sloughing terrain and erosion at creek crossings. The parking area has also expanded outside the established area onto sensitive natural ground. These expansion areas are experiencing vegetation loss, erosion and soil compaction.

Special Interest Areas/State Scenic Waterway

The McKenzie River is regionally and nationally renowned for its outstanding recreational opportunities and scenery. The segment between Belknap Springs and McKenzie Bridge Campground falls within the project area. The McKenzie River Special Interest Area (SIA), managed for scenery, fisheries, water quality, and recreation, is located in the project area. Segments of the McKenzie River are designated Oregon State Scenic Waterway, which is administered by the Oregon State Parks and Recreation Department. The State Scenic Waterway segments have a dual classification, with the west side of the McKenzie River classified as Scenic River Area and the east side of the river classified as Recreation River Area.

3.10.4 Environmental Consequences

Direct and Indirect Effects

Alternative 1 - No Action

Recreation use of the National Forest in the project area would remain unchanged with the No-Action alternative. The recreating public would continue to use the project area for recreational purposes, and would continue current use of developed and dispersed campsites, day use areas, interpretive sites, boat launches, trails, and roads. Therefore, Alternative 1 would have no direct or indirect effect on recreation within the project area.

Alternatives 2 and 3

Recreational Driving/Road Access

Short term effects of proposed timber harvesting, log truck hauling, and fuels treatments would include the following during timber harvest: localized road closures, and disruption to hunting, hiking, camping, and driving in some areas. The logging activity, hauling, and fuels treatments would likely cause noise and dust or smoke disturbances in some instances. No permanent roads would be constructed and no roads would be permanently closed as a result of the Goose project. Alternative 2 would construct 6.9 miles of temporary road and Alternative 3 would construct 2.2 miles. Road maintenance on secondary roads in the project area would improve ride quality and comfort for visitors seeking recreation opportunities in the area. Alternative 2 would maintain approximately 43 miles of road and Alternative 3 would maintain approximately 26 miles.

Off Highway Vehicle (OHV) use is not a recreational activity commonly pursued in the project area so displacement of OHV use is expected to be minimal. There is an OHV oriented trail system available on the district (Santiam Pass Recreation Area) and numerous other OHV opportunities exist on the district and forest road system.

Developed Recreation Sites

Hazardous Fuels Treatments would occur within the scenic corridor, adjacent to and within developed campgrounds, and around several of the recreation residences in the project area. These treatments would have short term direct effects such as increased noise during treatment periods. Slash piles would be noticeable immediately after treatments have occurred but would be burned, masticated and spread or removed. Stumps and other indicators of harvest activity would become less noticeable after vegetation recovery takes place (3-6 years). Overall, positive benefits would result from hazardous fuels treatments because of scenery improvements (increased depth of view into the forest) and for fire safety (reduced fuel loads). Proposed fuels treatments in unit 990 and 940 would improve public safety in Paradise and Limberlost campgrounds by reducing wildfire risk. A recreation specialist would be involved during the layout phase to ensure screening vegetation and other recreation assets are protected. Design features stipulate that no fuels treatments would take place when the campgrounds are open to ensure public access to these areas is not affected.

Dispersed Camping

Vehicle access miles would remain the same for Alternative 2 and improved access from road maintenance would occur on approximately 43 miles in Alternative 2 and 26 miles in Alternative 3. This would improve access to much of the project area, improving safety and driving comfort for road users who are seeking dispersed camping opportunities. Indirect effects of these improvements may include increased dispersed camping use and other activities in areas previously not used due to poor road conditions.

Trails

Frissell Trail and the trail head parking area would be closed while logging activity is underway to ensure public safety. Unit 460 encompasses the trail head parking area and the trail passes through units 470 and 480. Pre-sale tree and sale area boundary marking would be placed on the side of trees facing away from the trail to reduce visibility. Logging slash, skid trails and exposed stumps would be noticeable in the short term after harvest activity has concluded but would become less noticeable over time (3-6 years) as vegetative recovery takes place. Helicopter logging would be the harvest method used for units adjacent to the trail so there would be no damage to the trail tread. Design features would require removal, mastication or burning of logging slash, low cutting or angle cutting away from trail stumps near the trail and removal of timber sale boundary markers. A recreation trails specialist would be integrated into the layout phase prior to project implementation.

Frissell is a Class 3 trail that requires that a Visual Quality Objective (VQO) of Partial Retention be maintained (see Chapter 3.9 Scenic Quality). No scheduled even aged harvest treatments are proposed adjacent to Frissell Trail and would be consistent with forest plan direction that specifies that scheduled even aged harvest should not exceed seven percent of the suitable available area for Class 3 trails during the first 10 years following forest plan implementation (Willamette National Forest Land and Resources Management Plan; FW-046). Thinning treatments would be consistent with the VQO and design criteria would ensure that secondary impacts to visual quality associated with thinning treatments (logging slash, stumps and boundary markers) are mitigated.

Longer term beneficial effects to the trail as a result of project implementation would include an expanded and improved parking area at the trailhead and improved road access. Multiple trails and hiking opportunities are located nearby to accommodate the small amount of displaced use that would occur due to the closure of Frissell Trail during harvest activities.

In Alternative 3 units 470 and 480 would be dropped altogether. This would reduce direct and indirect effects by reducing trail closure times and the amount of log truck haul on access roads. Unit 460 would be retained in Alternative 3 so the lower trailhead and trail would still need to be closed during harvest activity. The duration of these effects would only last during implementation of the stand treatments.

No timber harvest or fuels reduction treatments are proposed adjacent to the McKenzie River National Recreation Trail (MNRT) so no direct effects to the trail would occur. Scenery would be maintained throughout those portions of the MNRT trail corridor in the project area (see Chapter 3.9 Scenic Quality).

Special Interest Area/State Scenic Waterway

Two hundred fifty-one acres of WUI treatments are proposed within the SIA under Alternative 2 and would be consistent with SIA management goals to preserve exceptional scenic, cultural, biological, geological or other unusual characteristics. Fuels reduction treatments consist of thinning underbrush and ladder fuels (branches and smaller trees) and are consistent with Forest Plan direction (MA-5a-09) to suppress wildfires at the lowest acreage practicable in SIA's. Fuels reduction treatments would be consistent with the management objective to reduce the severity of wildfires in the wild land urban interface and accomplish enhancement program goals to actively manage stands to reduce the potential for undesirable stand replacing fires (McKenzie River Special Interest Area Implementation Guide). No harvest activities are proposed within the SIA.

Scenic Waterway Act and Commission rules require the evaluation of proposed development within ¼ mile from each side of the river in a State Scenic Waterway. The McKenzie River Ranger District consulted with Oregon State Parks and Recreation Department; approval for timber harvest or salvage within this scenic waterway was requested May 29, 2012 and granted by Oregon State Parks and Recreation on September 28, 2012.

Cumulative Effects

Alternative 1

No direct or indirect effects to recreation would occur under Alternative 1 because no timber harvest is proposed under this alternative; therefore, no cumulative effects would occur.

Alternatives 2 and 3

Past and present natural and human caused disturbances or modifications including timber harvest and road construction are evident throughout the project area. Two timber sales have been recently completed in the project area and one is reasonably foreseeable. These three projects are the Foley Thin, 13 Thin and Pass Thin. These projects would add to incremental improvements to road conditions in the project area through maintenance activities, which may cumulatively increase dispersed recreation in the project area.

3.11 Inventoried Roadless Areas (IRAs) and Wilderness

3.11.1 Summary of Effects Analysis

No Inventoried Roadless Areas (IRAs) or designated Wilderness is in or adjacent to the Goose project area; therefore, no effects to IRA or Wilderness would occur from the of the Goose project.

3.11.2 Overview

Below is a definition and brief description of the correct terms as set forth by current law, regulation, agency policy, and the Willamette Land and Resource Management Plan, as amended.

Wilderness: A wilderness area is designated by congressional action under the Wilderness Act of 1964 and other wilderness acts. Wilderness is undeveloped Federal land retaining primeval character and influence without permanent improvements or human habitation (Willamette Forest Plan, page III-133). Wilderness recommendation and designation occurs at the forest planning level.

Inventoried Roadless Areas (IRA): These areas were identified in the 2001 Roadless Area Conservation Rule in a set of inventoried roadless area maps (contained in Forest Service Roadless Area Conservation Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at the National headquarters office of the Forest Service), or any subsequent update or revision of those maps (36 CFR 294.11). These areas were set aside through administrative rulemaking and have provisions, within the context of multiple use management, for the protection of inventoried roadless areas. Most IRA boundaries are substantially identical to those identified as “Roadless Areas” referred to in the 1982 planning rule (36 CFR 219.17) and identified by the Forest Plan, FEIS, Appendix C; however some localized, minor differences in boundaries may exist.

3.11.3 Affected Environment

No IRAs or Wilderness areas are in or adjacent to the Goose project area.

3.11.4 Environmental Consequences

No IRAs or Wilderness areas are in or adjacent to the Goose project area; therefore, no effects to IRA or Wilderness would occur from the of the Goose project.

3.12 Air Quality

3.12.1 Summary of Effects Analysis

The Blue River and McKenzie Bridge communities may experience smoke during the evening hours following the prescribed fires as diurnal wind patterns may carry smoke down the valley. Emissions created from Alternative 2 and 3 would be short term (approximately 2-5 days) and would vary in amount during the day and night time (less at night but more localized) depending on the fuels consumed and weather. Class 1 Airshed guidelines would be met. Wildfire smoke emissions are not short term and can impact communities and adjacent airsheds. Suppression efforts would still occur within and near the project area under Alternative 1, 2 and 3.

3.12.2 Scale of Analysis

The area defined for direct, indirect and cumulative effects analysis is the treatment units in the project area, as well as, the larger landscape where smoke emissions can travel. These are the location of the Design Areas and the Class I Airsheds. Acreage used for the wildfire calculation was 1,592 acres, the number of harvest and treated acres in Alternative 2.

3.12.3 Affected Environment

The State of Oregon has been delegated authority for attainment standards set by the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments. To regulate these standards, the state developed the Oregon Smoke Management Plan and the State Implementation Plan. These are guidelines and regulations for prescribed fire smoke emissions in Oregon. The Willamette National Forest has adopted this plan for emission control in Oregon (Forest Plan, 1990).

Smoke Sensitive Receptor Areas (SSRA) and Class I Airsheds are priority areas regulated in order to protect air quality. Eugene/Springfield, Redmond, and Oakridge are the closest SSRAs to the project area (42, 50, and 30 miles respectively). Three Sisters Wilderness and Mt. Washington Wilderness are the closest Class I Airsheds to the project area (3 and 7 miles respectively). Class I Airsheds must be protected from visibility impairment July 1 through September 15.

3.12.4 Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative 1 – No Action

If no management actions took place in the project area no air quality impacts would occur in a scheduled timeframe. However, the risk of wildfire would still exist. In the event of a wildfire, air quality impacts are considerably higher than prescribed fire. Smoke emissions are not short term and can often last for many weeks or months, as witnessed during the Puzzle and GW Fires in 2006 and 2007, respectively. Smoke emissions from wildfire are more likely to heavily impact communities and contribute to harmful, concentrated levels of particulate matter, posing risk to community residents, forest users, and firefighters.

Alternative 2 and 3

Prescribed fire of activity fuels in the project area would comply with Oregon Smoke Management Plan regulations. Smoke emissions would be mitigated based on the timing of the burns, seasonality, forecasted transport wind direction, and weather. Regulations enforce specific days which are suitable to burn in relation to other land owners burning or weather forecasts.

Recreationists and some local residents near project area may be temporarily impacted by smoke from the prescribed fire underburns or pile burning. In the Oregon Smoke Management Plan, non-harmful concentrations of drift smoke are considered nuisance smoke (Oregon SMP 1995). Mitigation measures, such as signing along roads or near treatment areas, would be made prior to burning.

Smoke emissions were predicted using the estimates from the debris prediction tables and FOFEM (First Order Fire Effects Model version 5.0). This model calculates particulate matter[1] (PM 2.5 and 10 micrometers) emitted based on the amount of fuel consumed using fuel loading, fuel moistures and

[1] Particulate matter also known as particle pollution or PM, is a microscopic complex mixture of extremely small particles and liquid droplets and contains a “number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mold spores). Fine particles, such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller (EPA website).

seasons (spring, summer, etc.). Fuel inputs were from the predicted post-harvest data and spring weather conditions were used for the prescribed fire, while summer weather was used for the wildfire runs.

The model outputs show 100 percent of the 1, 10 and 100 hour (0-.25, .25-1 and 1-3 inch diameter, respectively) consumed. However, from past experience, fuels treatments consume approximately 80 percent of the fine fuels (0-1 inch diameter), 60 percent of the 1-3 inch fuels and only about 20 percent of the 3-9 inch. Large woody debris >9 inches diameter is often too moist to be consumed. For example, Unit 80 is predicted to have 13.2 tons/acre of 0-3 inch fuel post-harvest. During the prescribed underburn of this unit, emissions are estimated at 5.85 tons of PM 10 and 5.39 tons of PM2.5. (See Fire/Fuels/Air Quality Specialist Report for all unit predictions).

The projected smoke emissions associated with activities in the project area would be substantially lower (less than 32 percent) than if a wildfire occurred on the same acreage. It is also important to note that prescribed burning in each unit would take place at different times, sometimes years apart, so the concentration of the smoke would be far less than if a large wildfire should occur. Alternative 3 would produce roughly one-third as much particulate matter than Alternative 2 due to the reduction in treatment acres.

Effects to air quality from actions proposed in the Goose project do not overlap in time and space with effects from any past, present or reasonably foreseeable future actions; therefore, the Goose project has no cumulative effects on air quality.

3.13 Economics

3.13.1 Summary of Effects Analysis

Alternatives 2 and 3 would have a positive benefit/cost ratio which would generate sufficient stumpage funds to pay for restoration activities, both required and optional. Alternative 2 would has a benefit/cost ratio of 1.30 or 17.1 percent larger than 1.11 for Alternative 3. In a matter of fiscal return on investment, Alternative 2 would cover all costs plus return approximately $4.6 million to the treasury while Alternative 3 would cover all costs plus return approximately $0.5 million to the treasury.

Alternative 1 would not contribute to local economy, forest sector jobs, or the National Forest Fund (NFF) which in turn contributes directly to local governments. Alternatives 2 and 3 would have beneficial direct effects to the local economy, forest sector jobs, and the NFF.

3.13.2 Scale of Analysis

The scale used to evaluate Economics associated with the Goose project is Lane County Oregon. The project lies entirely within the county and funds generated would contribute towards county payments. A majority of the purchasers who participate in timber sales on the McKenzie River Ranger District have offices and/or manufacturing facilities in Lane County.

3.13.3 Affected Environment

The project area is situated along Highway 126 around the community of McKenzie Bridge, Oregon. Highway 126, a major travel route for commercial and recreation traffic passing through this community, follows along the McKenzie River.

The economy of the local communities from the Springfield urban-growth boundary to McKenzie Bridge depends on a mixture of tourism, recreation, timber industry, and Forest Service jobs for stability. Local businesses that rely on tourism and recreation include: multiple inns and lodges, restaurants, stores, and gas stations, along with outfitters and guides. Timber industry jobs include a variety of forestry and mill jobs. Tourism and recreational activities connected with National Forest lands have been on the increase in recent years for the upper McKenzie River area. Employment connected with tourism and recreation-related services has also increased.

The current level of timber harvesting on the Willamette National Forest has dropped substantially from the levels of the mid-1980s. This decrease has contributed to a decline in the number of local jobs associated with the wood products industry and jobs which are dependent on other industries to spend money. The economic impacts of forest sector jobs contribute approximately 5.4 percent, or 6,595 jobs to Lane County, in addition to approximately 11.5 percent or $1.2 billion to the county's economic base (OFRI 2012, pg. 55). The same OFRI report states on pg. 41, that approximately 10.8 jobs are created with each incremental increase in million board feet made available for harvest. These jobs are direct effect jobs, or those associated in the harvest, indirect effect jobs, or those businesses that supply goods associated with harvest, and induced effect jobs, or those who work in the broader economy who benefit when people with direct or indirect jobs spend money (OFRI 2012, pg. 21).

After the original Goose Environmental Analysis was signed in 2010, three timber sales were sold which tiered to the analysis before the courts enjoined the decision. No harvest has occurred in association with these three sales. Based on selling values, these three sales would contribute approximately $561,000 dollars to the county for public services in addition to approximately $1.5 million which would provide funds to help restore stands in the project area.

3.13.4 Environmental Consequences

Direct and Indirect Effects

The direct economic effects of the alternatives are displayed in Table 55. A standard criterion for deciding whether a government program can be justified on economic principles is present net value (NPV) – the discounted monetized value of expected net benefits (OMB A-94). Another standard criterion for economic efficiency is the benefit/cost ratio (B/C ratio) which is the product of the present value of benefits divided by the present value of costs.

Alternative 1

The No-Action alternative would not harvest any timber, and therefore, would not support direct, indirect, and induced employment. It would not result in increased income to the regional or local economy (including the counties). Current levels of employment in the wood products sector would not change under this alternative. If the Goose project were not replaced by another project, the No-Action alternative could contribute to a continued decline in forestry and milling related jobs. The Forest Service would be responsible to replace the timber volume associated with the three sold sales, or pay damages incurred by the purchaser.

Alternative 2 and 3

All action Alternatives are economically viable, considering current selling values, timber volume per acre, yarding systems required, the proposed temporary road construction and system road maintenance needed, and the identified post-timber harvest projects identified in this analysis. The economic analysis utilized to make this determination is available in the Goose project analysis file at the McKenzie River Ranger District office. Based on the expected return to the Federal government plus the value of restoration activities potentially funded by stumpage shown in Table 55, Alternatives 2 and 3 would provide a positive benefit/cost ratio.

In general, the primary effect on timber harvest-related employment would occur from commercial timber harvest associated with the action alternatives from an estimated selling year of 2015 through a final harvest year of around 2019. As Table 55 indicates, both action alternatives would provide some opportunity for timber harvest-related employment. Alternative 2 would provide a higher net value than Alternative 3. Table 55 below discloses costs and revenues and the estimated present net value of each of the action Alternatives.

Though the combined economic benefit from implementation of any of the action alternatives is expected to be positive, each of the action alternatives from the Goose project would have a localized beneficial effect for the socio-economic environment of western and central Oregon with a greater impact to Lane County. Both action Alternatives would also have a benefit in the form of revenues going towards the National Forest Fund (NFF). Portions of revenue generated by the sale of timber from the action Alternatives would be available to the county for roads and schools. Alternative 2 would be expected to generate more than eight times the revenue generated with Alternative 3 due to MBF produced and acres harvested to spread the costs over (Table 55).

With the implementation of Alternative 2, the Forest Service would be able to maintain the timber sales under contract. Contract modifications would be required due to design criteria and riparian reserve change, however any minor volume discrepancies would not require complete contract termination or that the Forest Service replace the timber volume associated with the three sold sales, or pay damages incurred by the purchaser. Alternative 3 would require extensive contract modification of two sales as units not included in this alternative would require replacement of timber volume and/or the potential of the Forest Service to pay damages incurred by the purchaser. Additionally, because of dropping units from Alternative 2 to Alternative 3, one sale would no longer be implementable in its entirety and would require the Forest Service to replace the timber volume and/or pay damages incurred by the purchaser.

Table 55. Estimated Economic Alternatives (1) (2)

	Alternative 1	Alternative 2	Alternative 3
Timber volume produced (MMBF)	0	~35	~9
Discounted Cost (3)	$500,000	$15,506,951	$4,902,399
Discounted Revenues	$0	$20,109,226	$5,448,583
Net Present Value (NPV)	---	$4,602,275	$546,184
NPV per acre	---	$2,891	$895
Benefit/Cost Ratio	---	1.30	1.11

(1) Revenue based on the 2014 2nd quarter Oregon Department of Forestry pond values that have been discounted at 4 percent from 2014 until implementation.

(2) All values are for comparative purposes only. Actual values would be dependent on market values during time of sale and cost of associated activities at that time.

(3) Costs include approximate planning cost for the Goose project.

Cumulative Effects

Alternative 1

Because this is no action, there would be no impact on the environment from the incremental impact of an action when added to the impacts of other past, present, or reasonably foreseeable future actions (40 CFR §1508.7). Current levels of employment in the wood products sector would not be affected. If the Goose project were not replaced by another project, the No-Action alternative could contribute to a continued decline in forestry and milling related jobs.

Alternative 2 and 3

No past projects overlap in time of space with the Goose project, however, Pass Thin is a project reasonably foreseeable in the project area which would contribute .26 MMBF to the local economy. Alternative 2, the proposed action, would provide approximately 35 MMBF of timber to the local timber market, while Alternative 3 which would produce approximately 9 MMBF of timber. This project, when combined with Pass Thin would contribute to a beneficial cumulative effect of sustaining the wood products infrastructure in Lane and surrounding counties, while having a cumulative beneficial effect on timber harvest-related employment by providing timber to the local markets.

Cumulatively, Pass Thin plus implementation of either Alternative 2 or 3 would be beneficial in the form of revenues going towards the National Forest Fund (NFF). The minimum fund that is required to go to NFF is 25 percent of the received money from the timber sale. Alternative 3 would produce around 12 percent of the funds that Alternative 2 would produce.

3.14 Climate Change

The proposed action (Alternative 2) would treat approximately 2,452 acres in the project area. Harvest treatments proposed include commercial thinning, dominant tree release, gap creation, regeneration harvest and skips. Fuels treatments include mechanical treatments, post-harvest underburn, natural fuels underburn, and hazardous fuels treatments.

Climate change is a global phenomenon because major greenhouse gasses (GHG) mix well throughout the planet’s lower atmosphere (IPCC 2013). Considering emissions of GHG in 2010 was estimated at 49 ± 4.5 gigatonnes globally (IPCC 2014) and 6.9 gigatonnes nationally (US EPA, 2015), a project of this magnitude makes an infinitesimal contribution to overall emissions. Therefore, at the global and national scales, the proposed action’s direct and indirect contribution to greenhouse gasses and climate change would be negligible. In addition, because the direct and indirect effects would be negligible, the proposed action’s contribution to cumulative effects on greenhouse gasses and climate change would also be negligible.

The Intergovernmental Panel on Climate Change has summarized the contributions to climate change of global human activity sectors in its Fifth Assessment Report (IPCC 2014). In 2010, anthropogenic (human-caused) contributors to greenhouse gas emissions came from several sectors:

- Industry, transportation, and building – 41%
- Energy production – 35%
- Agriculture – 12%
- Forestry and other land uses – 12%

The main activity in this sector associated with GHG emissions is deforestation, which is defined as removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000). The Goose project does not fall within any of these main contributors of greenhouse gas emissions. Forested land would not be converted into a developed or agricultural condition. In fact, forest stands are being retained and thinned to maintain a vigorous condition that supports trees, and sequesters carbon long-term. US forests sequestered 757.1 megatonnes of carbon dioxide after accounting for emissions from fires and soils in 2010 (US EPA, 2015). There is agreement that the forestry sector contribution has declined over the last decade (IPCC, 2014; Smith et al., 2014; FAOSTAT, 2013).

However there is growing concern over the impacts of climate change on US forests and their current status as a carbon sink. There is strong evidence of a relationship between increasing temperatures and large tree mortality events in forests of the western United States. There is widespread recognition that climate change is increasing the size and frequency of droughts, fires, and insect/disease outbreaks, which will have major effect on these forests' role in the carbon cycle (Joyce et al. 2014).

The project is in line with the suggested practice of reducing forest disturbance effects found in the National Climate Assessment for public and private forests (Joyce et al. 2014). Here specifically, the project proposes to improve stand conditions, diversity, density and structure with thinning, gaps, and dominant tree release. Thinning the overstocked stands would make more growing space and resources available to the remaining trees, resulting in decreased tree stress and development towards larger diameter stands. The release of carbon associated with this project is justified given the overall change in condition increases forest resistance to release of much greater quantities of carbon from wildfire, drought, insects/disease, or a combination of these disturbance types (Millar et al. 2007). This project is also consistent with options presented by the IPCC for minimizing the impacts of climate change on forest carbon, and represents a potential synergy between adaptation measures and mitigation. Actions aimed at enhancing forest resilience to climate change by reducing the potential for large-scale, catastrophic disturbances such as wildfire also prevents release of GHG and enhances carbon stocks (Smith et al. 2014). The proposed action is consistent with these recommendations because it would improve stand conditions, diversity, density and structure, allowing the forest to adapt, persist and function better over time and into the future.

Timber management projects can influence carbon dioxide sequestration in three main ways: (1) by increasing new forests (afforestation), (2) by avoiding their damage or destruction (avoided deforestation), and (3) by manipulating existing forest cover (managed forests). Land-use changes, specifically deforestation and regrowth, are by far the biggest factors on a global scale in forests' role as sources or sinks of carbon dioxide, respectively (IPCC, Intergovernmental Panel on Climate Change, 2000). Projects that create forests or improve forest conditions and capacity to grow trees are positive factors in carbon sequestration. The proposed action (Alternative 2) falls into this category.

3.15 Unavoidable Adverse Impacts

Implementation of any of the alternatives, including the No-Action alternative, would inevitably result in some adverse environmental effects. The severity of the effects would be minimized by adhering to the direction in the management prescriptions and Standards and Guidelines in Chapter IV of the Willamette Forest Plan, as amended the Northwest Forest Plan, and additional design features proposed in Chapter 2 of this document. These potential adverse environmental effects are discussed at length under each resource section.

3.16 Irreversible and Irretrievable Commitments of Resources

“Irreversible" commitment of resources refers to a loss of future options with nonrenewable resources. An "Irretrievable" commitment of resources refers to loss of opportunity due to a particular choice of resource uses.

The soil and water protection measures identified in the Forest Plan Standards and Guidelines, design features in Chapter 2, and Best Management Practices are designed to avoid or minimize the potential for irreversible losses from the proposed management actions.

Concerning threatened and endangered plant, wildlife, and fish species, a determination has been made that the proposed actions would not result in irreversible or irretrievable commitment of resources that foreclose formulation or implementation of reasonable or prudent alternatives.

With all action Alternatives (2 and 3): Tree removal would result in an irretrievable loss of the value of removed trees for wildlife habitat, soil productivity, and other values. Little irreversible loss of soil should occur due to extensive design features associated with timber harvest and prescribed fire (tractor harvest only on slopes less than 35 percent, skyline yarding with partial or full suspension to meet Forest Plan Standards and Guidelines, etc.).

3.17 Short-Term Effects versus Long-Term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR §1502.16). This includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requires of present and future generations of Americans (42 CFR § 101(a)).

The Forest Plan establishes a sustained yield of resource outputs while maintaining productivity of resources. The specific direction and mitigation measures included in the Forest Plan and Northwest Forest Plan ensure the long-term productivity of resources will not be impaired by the application of short-term management practices. Additionally, project Design Features, Mitigation and Enhancement, and Monitoring (Section 2.5, 2.6, 2.7) were developed to reduce the environmental effects of the proposed activities and ensure project activities are implemented to comply with standards and guidelines, goals, objectives, conservation strategies and Best Management Practices.

Chapter 4 – List of Preparers

Bonny Hammons - Hydrologist
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Burtchell Thomas – Botanist
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Contribution: Botanical Resource Analysis
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Cara Kelly – Archeologist
USDA Forest Service, Willamette National Forest, McKenzie River Ranger District
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Contribution: Soils Analysis
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Dave Sanders – Recreation Planner
USDA Forest Service, Willamette National Forest, McKenzie River Ranger District
Contribution: Recreation, scenery and Wilderness analysis
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Elysia Retzlaff – NEPA Planner
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Education / Experience: B.S. Natural Resources Management, Forest Science: University of Wisconsin-Madison. Two years Project Manager, Willamette National Forest; five years Assistant Forest Silviculturist, Rogue River –Siskiyou National Forest; four years Silviculturist, Huron -Manistee National

Forest; one year Forester, Huron-Manistee National Forest; one year Forester, Green Mountain – Finger Lakes National Forest; two years Research Assistant, Forest Ecology and Management Laboratory.

James Rudisill – Certified Silviculturist
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Jessica Dole – Forest Landscape Architect
USDA Forest Service, Siuslaw National Forest
Contribution: Scenic Analysis and review of Chapter 3.9 – Scenic Quality
Education / Experience: B.S. Environmental Studies: University of Oregon; Master of Landscape Architecture: Cornell University; Registered Landscape Architect: State of Oregon. 26 years of experience with USFS as a landscape architect (Klamath, Okanogan, Siuslaw).

Kate Meyer – Fisheries Biologist
USDA Forest Service, Willamette National Forest, McKenzie River Ranger District
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Kenny Gabriel – *Civil Engineering Technician*
USDA Forest Service, Willamette National Forest, McKenzie River Ranger District
Contribution: Roads and Access Analysis
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Mei Lin Lantz – Fire and Fuels Specialist
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Ruby Seitz – *Wildlife Biologist*
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Additional Support and consultation was provided by the following individuals:

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Jude McHugh, Forest Public Affairs	Shane Kamrath, Wildlife Biologist & Staff Liaison
Dan Fleming, Logging Systems Specialist	Suzanne Schindler, Forest Planner
Tim Fox, Heritage Technician	Starr Sullivan, Civil Engineering Technician
Anita Leach, Sweet Home Ranger District, Planner	

Chapter 5 – List of Agencies, Governments, Organizations, and Individuals Given Notice of Availability

The agencies, governments, organizations, and individuals listed below were notified of the availability of the Draft Environmental Impact Statement (DEIS) prior to the 45-day comment period, as well as the availability and of this Final Environmental Impact Statement (FEIS) and the associated Draft Record of Decision (ROD) and pre-decisional administrative review (objection) period. A complete list of recipients, including names and contact information, is available in the Goose project file at the McKenzie River Ranger District.

Agencies and Governments

Confederated Tribes of Grand Ronde
Confederated Tribes of Siletz Indians
Confederated Tribes of Warm Springs
Eugene City Council
Eugene Water and Electric Board
Klamath Tribes
Lane County
Linn County
Office of Congressman Peter DeFazio
Office of Senator Jeff Merkley
Office of Senator Ron Wyden
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of Forestry
Oregon Department of Parks and Recreation
Springfield City Council
United States Environmental Protection Agency
United States Fish and Wildlife Service

Organizations

American Forest Resource Council
Cascadia Wildlands Project
Forest Conservation Council
Forest Issues, Many Rivers Group, Sierra Club
Giustina Land & Timber
Giustina Resources
Lane County Audubon Society
McKenzie Clearwater Coalition
McKenzie Flyfishers
McKenzie River Chamber Of Commerce
Mule Deer Foundation
Native Forest Council
North American Butterfly Association
Obsidians
Oregon Council, Federation of Flyfishers

Oregon Hunters Association
Oregon Nordic Club, Willamette Chapter
Oregon Society of American Foresters
Oregon Wild
Pacific Crest Trail Association
Quail Unlimited
River Reflections
Rocky Mountain Elk Foundation
Rosboro Lumber Co.
Santiam Wilderness Committee

Individuals

Over 1,500 people, including interested parties, stakeholders, landowners, and individuals that provided comments during project scoping and the DEIS 45-day comment period have been notified via email and letter of FEIS and ROD availability. A complete list of recipients, including names and contact information, is available in the Goose project file at the McKenzie River Ranger District.

Appendix A – Proposed Treatment Descriptions for the Action Alternatives

Proposed treatments for the Goose project area are thinning, gaps, skips, Dominant Tree Release (DTR), regeneration harvest (Shelterwood with Reserves), natural fuels underburn, hazardous fuels treatment, and various post-harvest fuels reduction treatments.

Activities Common to Thinning

Thinning would maintain/increase the health and vigor of the remaining trees not harvested. Skips and gaps ranging between 1-3 acres (see Gaps, and DTR description below) would be placed in many of the stands to promote vertical and horizontal diversity (see Appendix B for a unit by unit prescription). The use of skips and gaps would be part of an un-even aged management approach. Un-even aged management would not be applied to all stands; some may not contain any gaps.

Conifer trees would be removed through commercial thinning across all size classes, but would primarily consist of smaller diameter trees. Sugar pine and white pine would not be removed from the stand; however they may be cut for operational purposes. Generally, remnant large woody debris on the forest floor would be maintained or increased throughout the stand. Snags would be maintained on site if not a hazard to logging operations.

Project generated fuels may be removed with treatments such as biomass utilization, piling and burning, underburning, mastication, firewood collection, or chipping. However, not every acre harvested would have fuels treatments prescribed. Areas which are projected to be below the standards and guidelines (FW-212 and 252) presented by the Forest Plan would likely have minimal fuels treatments prescribed. All post-harvest fuels treatments would reduce fuel loads within the stand.

Activities Common to Gaps and Regeneration Harvest

Retention trees would be left (see description below for specifics) in openings to function as legacy trees that would benefit a variety of resources. Live retained trees would be released to encourage large tree development, future snag creation, diversity in future stand structure, and development of future large down woody debris.

Retention trees may be spaced both sparsely throughout the opening and also in clumps, increasing the diversity across the landscape. Emphasis would be placed on retaining multiple desired retention tree species where feasible. Live trees with ‘elements of wood decay’ may be selected as retention trees, which could include trees with features like dead tops, broken tops and heart rot. This would increase the diversity of the prescriptions across the landscape.

Live retention trees may or may not be used as snag (wildlife) enhancement projects; however, retention trees meeting criteria for wildlife trees (i.e. having Phellinus pini conks or other elements of wood decay) would serve as a wildlife tree and offset the need for further enhancement. In stands where snags or down woody material would be created after harvest, additional trees may be left that can be utilized. Snags would be maintained on site, if not a hazard to logging operations.

Thinning Descriptions

Thinning: Thinning treatments would reduce canopy cover within a stand between approximately 30-60 percent. The residual stand, post-harvest (not including gaps put in the stand), would have approximately 25-55 percent of the maximum Stand Density Index (SDI) (see Chapter 3.1for discussion on SDI). The prescription aims to stay below 55 percent SDImax, which is where inner tree mortality likely begins to occur (Tappeiner et al. 2007). Gaps, dominant tree releases, as well as skips (areas not harvested) would likely be placed in the stands being commercially thinned.

Thinning would increase the health and vigor of the remaining trees and help increase the stands ability to adapt to environmental changes. Additional light, from reduced canopy cover, reaching the forest floor would help promote a second cohort of trees. Both shade-tolerant and intolerant species may be established; however, shade-tolerant species would thrive over time as the overstory crown closes. The canopy cover is estimated to increase 2 percent per year (Chan, 2006). This second generation of trees growing under the overstory canopy is expected to provide vertical, horizontal, age, and species diversity in the stand by primarily harvesting Douglas-fir which is over represented in the project area because of planting densities.

Conifer trees would be removed through commercial thinning across all size classes, but would primarily consist of smaller diameter trees with an emphasis on retention of sugar pine and white pine; however these species may be cut for operational purposes. This prescription would also maintain or increase vegetative diversity in the understory by opening the canopy to allow for growth of seedlings, as well as the development of understory shrubs and forbs which have broad ecosystem benefits.

Thinning provides growing space for new trees to increase age, size and height diversity in a stand and at the project area scale. Young uniform stands such as the plantations and many natural stands proposed for treatment in the Goose project can be diversified with early thinning by allowing new generations of trees to establish. Early commercial thinning has been shown to be beneficial to the future development of understories, the promotion of natural regeneration, and in enhancing biodiversity (Muir et al 2002). With early thinning, overstory trees can develop deep canopies and large-diameter branches in open stands (McGuire et al 1991). Low overstory density facilitates the establishment of understory trees (McGuire et al 1991, Bailey and Tappeiner 1998, Miller and Emmingham 2001).

Treating mature stands in the Goose project is expected to increase availability of resources such as sunlight to the forest floor for increased diversity of shrubs, herbs, and understory tree establishment and growth with the effects lasting up to about 15-20 years as the overstory crown closes in (Chan, 2006). In addition to the understory response, increased growth in the overstory is expected to last up to about 25 year (Latham and Tappeiner, 2002). Williamson (1982) found that 19 years after heavy thinning, a 100 year old thinned stand, had a 30 percent higher response to volume growth than did the control units. Thinning across all crown classes in a stand provides the longest term benefits to both large and small trees because of the time it takes to fill in the overstory canopy (Williamson and Price 1966).

Heavier thinning would likely promote rapid growth of trees with characteristics normally associated with old trees in old-growth stands. The large older trees in a stand often showed signs of rapid growth in lower densities when they were young (30-100 years), producing large stems and crowns. Evidence (Franklin et al 1981, Tappeiner et al. 1997) suggests that growth rates of some older forests indicate slow regeneration and at low densities over a long period with little tree-to-tree competition. Old-growth stands typically have multiple canopy layers, and thinning promotes a second cohort, or canopy layer, by allowing for natural regeneration to occur (Tappeiner et al. 1997).

Some old-growth forests appear to have developed from relatively even-aged cohorts that have undergone long-term suppression mortality, little understory regeneration of Douglas-fir, and episodic release of established tolerant conifers (Winter et al 2002a, 200b). Therefore, stand management can follow multiple routes that emulate natural processes to move dense young stands towards structure similar to old-growth forest.

A short-term (less than one year) impact to understory vegetation and below ground fungi could occur from logging. These short-term adverse effects would be expected to recover within two years post-harvest as regrowth of herbs and shrubs occur. The removal of host trees and soil disturbance from the yarding operation impacts below ground fungi (Courtney et al 2004). This adverse effect is reduced by minimizing additional soil impacts with the use of designated skid trails with ground–based yarding systems and log-suspension capabilities of skyline and helicopter yarding systems.

Gaps (GS): Gaps would be randomly placed unless it was necessary to strategically place the openings within a stand for other resource benefits such as minimizing conflict for current and/or expected future logging operations. Gaps may also be placed to provide higher quality early seral habitat for wildlife species like big game, or to provide scenic vistas. The gaps would be randomly shaped following features of the landscape when available, and would range in size from approximately 1-3 acres. When a root rot pocket is identified, a gap would be placed with a 50-foot buffer established around the outside of the root rot pocket which could result in a gap larger than three acres.

Gaps would be placed in stands that have been identified as potentially higher quality early seral habitat areas by our district wildlife biologist and to provide for horizontal and vertical diversity in stands. A thinning prescription would be applied to the area outside the gaps.

Gaps would not be a conventional clear-cut treatment. The objective would be to leave some green trees in either scattered pockets and/or scattered throughout the opening post-harvest. These retention trees would be released to grow to encourage large tree development, future snag development, diversity in future stand structure, and development of future large down woody debris. In 30 to 60 years the stand structure would be more complex with at least a two cohort stand making up the overstory. This would better mimic some late successional characteristics than what the current stand is projected to produce in the same time frame if no treatment occurred (Andrews et al. 2005).

Dominant Tree Release (DTR): DTR is a method that replicates small disturbances and increases structural variability. This prescription would provide for growth of dominant trees to promote the distribution of larger trees scattered throughout the stands. The area around the dominant tree would be cut to a radius of one chain (66 feet) from the bole of the dominant tree to nearest bole of another tree. Sugar pine, white pine, and western red cedar, would not be cut in the DTR. The one chain radius would result in an approximate ¼ acre opening in the crown (from canopy to canopy) placed around the tree. For units having DTR's there would be anywhere from 2-8 dominate trees selected. DTR trees would be randomly placed throughout stands, including riparian areas when the objective within the riparian area includes treatment.

Trees selected for DTR would be the largest trees that best represent site potential in a given area. When under represented species are identified in a stand, the DTR may target these species such as sugar pine, white pine, and western red cedar as the dominate tree to be released. Although the underrepresented species may not be a dominant tree, they would represent the dominant trees of their particular species and help increase diversity. Occasionally a group of two trees would be selected in one DTR. The canopy cover of the stand would be adjusted based on the ¼ acre DTR having a canopy cover of 4 percent.

Within all units, a sugar pine would be used as the dominant tree in an effort to help promote sugar pine's health and vigor as well as regeneration. Sugar pine that are 24" dbh and larger with a maximum of 5 trees selected per 10 acres would be used as Dominant Tree Release. All trees within a radius of one chain from the bole of the sugar pine would be cut and removed regardless of species with the exception of another sugar pine located within the cut area or a tree greater than the DBH of the sugar pine selected.

No Harvest Skips (NH): No harvest skips are areas within units that would not have trees removed however some trees within a skip may have trees cut and left on site such as in skyline corridors. There may also be wildlife trees or down wood created within these areas. These areas are either no harvest buffer around Riparian Reserves, cultural sites, and sensitive species, or are areas that are randomly selected to allow for natural succession to take place.

Regeneration Harvest - Shelterwood with Reserves

Silviculturally these stands are currently at the culmination of mean annual increment. All stands are currently experiencing inter-tree competition, which creates stand stress and makes them susceptible to insect and disease outbreaks.

On average there would be 20 trees retained per acre to help establish a future stand by providing a beneficial microclimate, and contribute towards creating snags and down wood. The regeneration harvest would result in more complex stand structure in 30 to 50 years with a two aged canopy layer that more closely mirrors what may have happened with natural disturbances on the landscape.

The residual canopy would be composed of the largest trees in the stand, primarily Douglas-fir. As identified in the Standards and Guidelines of the Northwest Forest Plan, at least 15 percent of each stand (not including Riparian Reserves) would be retained in no-harvest patches to provide diversity and maintain existing snags (Northwest Forest Plan, pg. c-41). The retained patches would be scattered and variable in size. Large wood on the forest floor would be maintained or enhanced. Numerous snags would either be maintained on site if not a hazard to logging operations, or enhanced through snag creation techniques. Retention areas would be set aside with no commercial products removed from the area. Snag and down woody debris creation would likely occur in the retention area and count towards the average snags and down woody debris within unit (Northwest Forest Plan, p. C-41).

Stands treated as regeneration harvest would be treated for fuels reduction and planted with a variety of tree species after harvest.

Post-Harvest Tree Planting

Reforestation would be expected to occur within five years of harvest, and occur from both tree planting and natural regeneration. Post-harvest densities would be sufficiently low to allow shade-intolerant species such as Douglas-fir to regenerate in addition to increasing diversity with the ingrowth of species such as western white pine and western red cedar. Skid roads in planting areas are expected to be subsoiled to a depth of 18-22 inches to reduce the effects of compaction with the exception of soils under a retention tree canopy because the roots of the given tree would be less disturbed. Compaction from skid roads has not shown a reduction in residual tree growth (Miller et al, 2007). Slash and other debris would be utilized as shade and as a deterrent to browse by ungulates. Planting in identified root rot pockets would be species that are less susceptible to root rot like western red cedar, sugar pine, white pine or red alder. No additional effects would be realized by completion of this project because planting has been accounted for in the Forest and Stand Structure analysis.

Natural regeneration is unpredictable based on timing of cone crops and occupation of the site by competing vegetation, therefore surveys would occur around three years after treatment to verify minimum stocking levels in the natural regeneration. If surveys show less than 200 trees per acre are present, planting with western red cedar, white pine, sugar pine, and/or Douglas-fir would occur to augment the natural regeneration.

Fuels Treatments Description

Post-harvest fuels treatments are intended to reduce fuels in the Wildland-Urban Interface (WUI). Treatments are guided by the Forest Plan standards and guidelines for Maximum Acceptable Fuel Loadings of downed woody material. These guidelines are as follows (FW-212 and FW-252):

Within the proposed harvest units it is estimated (from field surveys and photo series) that current surface fuel loading on average is below the Forest Plan standards and guidelines. However, in many stands post-harvest fuel loadings are projected to be above standards and guidelines.

Allowable Downed Woody Material	
Diameter	**Tons/Acre**
0-3”	7-11
3”-9”	8-12
9”-16”	18-20
>16”	8-15 pieces/acre >20ft.

Proposed post-harvest fuels treatments would consist of hand treatments, yarding tops, mechanical treatments and/or underburning. Underburns may require the construction of handlines around the unit perimeter. These are created prior to the burn and aid in containing the prescribed fire within the unit boundaries. Handlines are created by scraping fuel back to an approximate 18” mineral soil line and scattering fuels that lie within about 10 feet of the proposed line. If units are located on a steep slope waterbars are created within the fireline to reduce erosion potential.

The implementation of fuels treatment may vary in method from what is the proposed in the alternatives to meet standards and guidelines (i.e. grapple piling instead of underburning). However, the implemented fuels treatments would remain within the range of effects analyzed in the Environmental Impact Statement.

Hand Treatments and Mechanical Treatment: Hand treatments require manually hand piling created slash that is ≥1 inch in diameter and ≥3 feet in length. Mechanical treatments use machines to pile or chip/mulch fuels. Slash piles may occur within the unit or at landing(s). Piles would generally be placed in locations to minimize the damage of residual standing snags or live trees; however some piles could be located to cause tree mortality to create snags for wildlife habitat. Piles would then be burned at a later date after the slash has sufficiently dried and conditions would not allow fire to spread to surrounding area.

Hand, grapple, and landing piles are covered with approved plastic following construction. This creates a drier pocket of fuel in the middle of the pile and enables them to be burned in the late fall or early winter when there is very low risk of the piles spreading into other fuels.

Yarding Tops: Yarding tops occurs during harvest operations. Tree tops are removed from the harvest unit to the landing areas. The tops are then separated where they can either be utilized (i.e. firewood or biomass) or piled for future burning. This treatment aids in reducing the post-harvest fuel loading within the harvest unit.

Post-Harvest Underburn: Post-harvest underburns are intended to reduce fuels created by harvest activities and help promote structural and biological diversity in stands. Low-to-moderate intensity surface fire would reduce competition of shade tolerant species within the residual stand. Underburning would comply with Forest Plan standards and guidelines in regards to consumption of fuels and maintaining down-woody material, duff cover, and snags. Spring-like burning conditions would reduce the risk of burning large woody material because of high moisture content and provide conditions for lower fire intensity meeting fuels treatment standards and guidelines. An objective for the post-harvest underburning would be to minimize overstory tree mortality; however, some mortality of 0 to 10 percent would be acceptable. Mortality trees that occur adjacent to roads may be removed for safety reasons.

Natural Fuels Underburn: The purpose of this treatment is to reduce fuels and raise tree canopy base height in WUI as well as re-introduce fire as a natural disturbance process into the landscape. These stands have not been commercially harvested. The stands are generally older (120+ years) and include large trees (>24" DBH) with well-developed bark that can better withstand fire along with smaller understory trees that can act as a ladder for fire to move from the surface into tree canopies. These stands should be burned in spring-like conditions where large woody debris, duff, and live green trees have higher fuel moisture that reduces their potential to burn. The underburning prescription should be a low-to-moderate intensity surface (ground/understory) fire with possible torching of individual trees or small groups of trees (about 3-5 trees) causing tree mortality. Mortality would primarily be in the intermediate and understory trees. Some hand cutting of smaller trees (<4 inch dbh) may be done prior to burning to aid with burning and keeping overstory mortality within prescribed parameters. Underburning these stands is the preferred method of treatment not only to reduce hazardous fuel loading but to return fire to the ecosystem as a natural disturbance process. When using fire as a tool on the landscape there is always a chance for the fire to create higher mortality due to variability in environmental conditions. Anticipated mortality would be around 0-10 percent in trees 17" dbh and larger; 10-20 percent in trees 13-16" dbh; 20-40 percent in trees 7-12" dbh; and 50-100 percent in trees less than 7" dbh. These units could be underburned independently or in conjunction with surrounding harvest units. Mortality trees that occur adjacent to roads may be removed for safety.

Hazardous Fuels Treatments: This prescription would reduce fuels in the Wildland-Urban Interface through non-commercial methods. The primary objectives are to reduce ladder fuels and surface fuel loads (horizontal and vertical continuity). Stands with this treatment are generally older (>120yrs old) and would focus on cutting trees and shrubs no greater than 10 inches at DBH. Changes to the fuel and stand structure would reduce potential wildfire behavior in the McKenzie Bridge Wildland-Urban Interface. Treatments include: cutting/thinning, hand piling and burning, chipping, mastication, or firewood.

Roads Treatments

Road Maintenance: For all action alternatives, existing forest roads needed for harvest activity would be maintained to allow safe access to harvest areas and to reduce adverse impacts to resources. Road maintenance associated with haul routes would result in decreased maintenance cost, improved safety, and reduced potential for resource damage related to degraded roads that would be needed for current and future resource management. Road maintenance activities may include felling danger trees, clearing and grubbing, replacing drainage structures, asphalt pavement patching, repairing holes in the roadbed, reconstructing ditches, application of dust abatement material, and placement of aggregate surfacing.

Temporary Road Construction and Decommissioning: Temporary roads would be created in both action alternatives. These roads would be placed in areas to minimize impacts to resources and would be decommissioned after use. Previously disturbed sites would be utilized where possible. The initial effects of the construction would be compacted soils; however those effects would be offset by decommissioning. The effects of decommissioning would be the same as subsoiling, and is generally beneficial to the residual stand because of reduced compaction and root growth, so increased growth is possible along skid trails and landings that have treatment.

Appendix B – Detailed List of Project Activities by Unit for the Proposed Action

Unit	Acres	Harvest Prescription Acres(1)					Logging System Acres(2)			Post-Harvest Fuel Treatment Acres(3)			Est. Vol. (MBF)	Est. MBF per Harvest Acre
		Skips	Thin	DTR	SH	Gaps	H	Sk	G	MT	HP	UB		
10	392	80	266			46	100	212	0		80		6744	22
30	22	2	13			7	20	0	0		11		312	16
40	49	3	42	4			0	15	31	17	10		389	8
50	17	2	15				0	15	0		3		146	10
60	10	3	5			2	0	7	0		4		95	14
70	22	1	14	2		5	0	0	21			21	403	19
80	19	1	15			3	0	0	18			18	248	14
90	78	27	33	6		12	0	13	38	20	2		915	18
100	40	18	16			6	0	8	14	15			377	17
110	62	23	32			7	0	0	39	39			580	15
120	10	1	8			1	0	6	3	3			91	10
130	23	13	7			3	0	0	10			10	431	43
140	5	2	5				0	0	5	2			39	8
150	18	2	11			5	0	0	16	10			126	8
190	26	4	17	2		3	0	17	5	6	4		302	14
200	8	6	0			2	0	0	2			2	86	43
210	10	2	5			3	0	0	8	7			122	15
220	10	1	7			2	0	3	6	5			134	15
260	36	25	11				0	9	2	4	5		158	14
270	2	0	2				0	0	2	2			44	22
280	2	0	1	1			0	0	2	2			32	16
290	2	0	2				0	0	2	2			11	6
300	63	21	28			14	0	21	21	31	10		1751	42
310	6	1	4			1	0	0	5	5			58	12
320	33	4	24			5	0	22	7	7	15		896	31
330	17	7	5			5	4	6	0			10	592	59
340	17	6	5	6			11	0	0		3		439	40
350	18	8	5	5			10	0	0		3		495	50
360	9	3	6				0	0	6	6			33	6
370	9	0	8			1	0	0	9	9			109	12

Unit	Acres	Harvest Prescription Acres(1)					Logging System Acres(2)			Post-Harvest Fuel Treatment Acres(3)			Est. Vol. (MBF)	Est. MBF per Harvest Acre
		Skips	Thin	DTR	SH	Gaps	H	Sk	G	MT	HP	UB		
380	69	34	20			15	0	25	10			35	2096	60
390	10	2	6			2	0	4	4			8	222	28
400	4	1	3				0	0	3	3			12	4
410	8	1	7				0	0	7	7			74	11
420	27	9	17	1			0	0	18	9			172	10
430	15	1	14				0	0	14	9	5		85	6
440	12	3	8	1			0	9	0		6		39	4
450	28	18	10				1	7	2	2	5		240	24
460	19	10	8	1			0	9	0		7		232	26
470	60	13	39			8	47	0	0			55	1396	30
471	11	3	0		8		4	0	4			4	297	37
480	45	15	24			6	0	0	30	30			1235	41
490	8	4	4				0	0	4	4			13	3
500	21	6	15				6	0	9			15	644	43
510	13	1	12				0	0	12	12			99	8
530	80	18	49			13	4	27	31	20	12		1252	20
540	8	1	7				0	0	7	7			83	12
550	18	4	12			2	0	9	5	5	4		400	29
570	19	2	14			3	0	7	10	10	2		285	17
580	14	0	11			3	0	0	14	14			243	17
590	6	1	5				0	0	5	5			68	14
600	61	3	43	2		13	0	44	14	14			1257	22
610	26	2	16	2		6	0	0	24	20			420	18
620	51	7	27			17	0	0	44			48	1002	23
630	24	2	15	2		5	0	22	0		8		431	20
640	79	12	59	2		6	8	42	17			70	1366	20
650	22	4	13	5			0	0	18	18			243	14
660	34	1	26	1		6	0	0	33	25			602	18
670	6	1	4	1			0	0	5	5			61	12
680	2	0	2				0	0	2	2			20	10
690	15	0	11	1		3	0	15	0			15	438	29
691	12	2	0		10		0	3	7			10	214	21
700	12	1	9	2			0	0	11	9			129	12
710	68	7	41	2		18	0	0	61			61	1124	18
720	29	4	0		25		0	0	25			25	957	38

Unit	Acres	Harvest Prescription Acres[1]					Logging System Acres[2]			Post-Harvest Fuel Treatment Acres[3]			Est. Vol. (MBF)	Est. MBF per Harvest Acre
		Skips	Thin	DTR	SH	Gaps	H	Sk	G	MT	HP	UB		
740	8	0	7	1			0	0	8	3			59	7
760	25	0	18			7	0	0	25			25	480	19
770	50	5	30			15	0	5	40			45	820	18
Total	2056	464	1218	50	43	281	215	582	795	425	199	477	34968	22

-1	Skips: Riparian and Non-Riparian Skips, Thin: Riparian and Non-Riparian Thinning, DTR: Dominant Tree Release, SH: Shelterwood Harvest, Gaps
-2	H – Helicopter, Sk – Skyline, G – Ground Includes harvested acres, not skips
-3	MT – Mechanical Treatment, HP – Hand Pile, UB – Underburn actual numbers would be dependent on feasibility and funding at harvest

Alternative 3 has same unit prescriptions. Units for Alternative 3 are: 40, 50, 60, 70, 80, 90, 100, 110, 140, 150, 190, 210, 220, 310, 360, 370, 390, 400, 410, 430, 440, 460, 570, 580, 610, 650, 660, 670, 680, 700, 710, 740, 760, and 770.

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Appendix C – Compliance with Laws, Regulations and Executive Orders

The National Environmental Policy Act (NEPA), 1969 – NEPA establishes the format and content requirements of environmental analysis and documentation. Preparation of the Goose FEIS was prepared in full compliance with these requirements.

The National Forest Management Act (NFMA), 1976 –All proposed timber harvest units are planned to occur on suitable land. If regeneration harvest is implemented the sites would be capable of restocking within 5 years of harvest by either natural or artificial means. All units were considered for potential uneven-aged management. Proposed commercial thinning would increase the rate of growth of remaining trees. Some locations would favor species or age classes most valuable to wildlife. The resultant reduced stress on residual trees would make treated stands less susceptible to pest-caused damage. Design features have been identified to protect site productivity, soils, and water quality.

The burning of activity fuels would reduce long-lasting hazards from wildfire and reduce the risk of pest outbreaks over the project area as a whole. Air quality would be maintained at a level that would meet applicable Federal, State, and local standards. All proposed activities would provide sufficient habitat to maintain viable populations of fish and wildlife. Critical habitat for threatened or endangered species would be protected through avoidance. The action alternatives would accelerate development of forest habitats that are currently deficient within the analysis area to enhance the diversity of plant and animal communities in the long-term. See discussions under the applicable resource sections above, for further support that proposed activities that would comply with the seven requirements associated with vegetative manipulation (36 CFR 219.27(b)), riparian areas (36 CFR 219.27(e)), and soil and water (36 CFR 219.27(f)).

Forest Plan Consistency – Actions analyzed in the Goose FEIS are consistent with a broad range of Forest Plan Standards and Guidelines that have been discussed and disclosed throughout the document. The timber stand treatments associated with the project are consistent with the goals and management direction analyzed in the Willamette National Forest Land and Resource Management Plan FEIS and Record of Decision. Road improvements are designed to be consistent with the 1994 Northwest Forest Plan amendments to the Forest Plan and the Aquatic Conservation Strategy objectives.

Northwest Forest Plan Aquatic Conservation Strategy - The Aquatic Conservation Strategy (ACS) is an integral part of the Northwest Forest Plan and was developed to maintain and restore the ecological health of watersheds and aquatic ecosystems on public lands through implementation of four components: 1) riparian reserves 2) key watersheds 3) watershed analysis 4) watershed restoration. Based on the analysis presented in this FEIS and Appendix E, the ACS Objectives would be met in each alternative.

The Preservation of Antiquities Act, June 1906 and the National Historic Preservation Act, as amended, October 1966 – Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation governing the treatment of historic properties (a.k.a. heritage or cultural resources) during project planning and implementation. Other legal framework considered the effects of its actions on heritage resources is listed below:

- 36 CFR800 (Protection of Historic Properties),
- 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), and
- 36 CFR 296 (Protection of Archaeological Resources), and

- Executive Order 13007 – Sacred Sites

The 1995 Programmatic Agreement (PA) among the USDA Forest Service PNW, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer (SHPO) Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service, (amended in 2004), provides a process by which the Forest Heritage Specialist may certify that the Forest has complied with Section 106 of NHPA for the project.

In accordance with this PA, an appropriate inventory was conducted in July 2009. All known cultural sites in the Area of Potential Effect (project area) were protected by avoidance, resulting in a determination of "No Historic Properties Affected" on November 19, 2014. Documentation was provided by SHPO and copies have been retained in the Forest and District Heritage files.

Clean Air Act Amendments, 1977 – The alternatives are designed to meet the National Ambient Air Quality Standards through avoidance of practices that degrade air quality below health and visibility standards. This project is consistent with by the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments (See Chapter 3.2 and 3.12).

The Clean Water Act, 1987 – This act establishes a non-degradation policy for all federally proposed projects. Compliance with the Clean Water Act would be accomplished through planning, application and monitoring of Best Management Practices (BMPs). Based on the analysis presented in this FEIS, TMDL requirements for the McKenzie Basin would be met in each alternative (See Chapter 3.4).

The Endangered Species Act (ESA), December 1973 – The ESA establishes a policy that all federal agencies would seek to conserve endangered and threatened species of fish, wildlife and plants. Biological Evaluations for plants and wildlife have been prepared, which describes possible effects and impacts of the proposed action on sensitive, and other species of concern that may be present in the project area. A Biological Assessment (BA) was prepared for the northern spotted owl, and for bull trout, and spring Chinook salmon.

Endangered Species Act (ESA) informal consultation with the U.S. Fish and Wildlife Service (USFWS) for Upper Willamette River spring Chinook salmon and Columbia River bull trout was completed during the development of the EA (2009-2010). In March 2010, a final Biological Assessment was submitted to USFWS. A letter of concurrence was received from April 14, 2010 concurring with the determinations in the Biological Assessment (below). No conservation measures were issued. During development of this FEIS, it was determined that no additional consultation was required as only minor changes were made to the proposed action, mostly being more conservative (i.e. larger no-treatment buffers).

Upper Willamette River spring Chinook Salmon (Evolutionarily Significant Unit-ESU)	May Affect, Not Likely to Adversely Affect
Upper Willamette River spring Chinook Salmon (Critical Habitat)	May Affect, Not Likely to Adversely Affect
Upper Willamette River spring Chinook Salmon (Essential Habitat)	Will Not Adversely Affect
Bull Trout (Distinct Population Segment-DPS)	May Affect, Not Likely to Adversely Affect
Bull Trout (Critical Habitat)	May Affect, Not Likely to Adversely Affect

Endangered Species Act (ESA) formal consultation with the USFWS for the Northern Spotted Owl was completed in 2009 and evaluated by the USFWS in the 2009 Biological Opinion (FWS reference 13420-2010-F-0001) signed November 25, 2009. Subsequently, Critical Habitat for the northern spotted owl was modified with the 2012 Critical Habitat Rule. This resulted in reinitiation of consultation and an additional Biological Opinion (FWS Reference Number 01EOFW00-2013-F-0115) that addressed the effects to 2012 Critical Habitat for activities proposed by the Goose project. USFWS issued an additional Biological Opinion with the following determinations on April 22, 2013.

Goose Project	May Affect and Likely to Adversely Affect the Northern Spotted Owl-May Result in Harm to 2 Spotted Owl Sites due to Habitat Modification from Thinning, Underburning, and Disruption, Incidental Take to 5 owls (2 pairs and 1 resident single)
Goose Project	Not Likely to Jeopardize the Continued Existence of the Spotted Owl
Road Construction in Suitable RA32 Habitat within 2012 Critical Habitat (~2 acres or 0.25 miles)	May Affect and Likely to Adversely Affect Critical Habitat
Fuels Reduction Treatments (WUI) in 2012 Critical Habitat (21 acres of suitable and 4 acres of non-habitat)	May Affect, Not Likely to Adversely Affect Critical Habitat
Commercial Thinning in Critical Habitat (dispersal habitat)	May Affect, Not Likely to Adversely Affect, mostly Beneficial Effects on Future Foraging and Nesting/Roosting Habitat in Critical Habitat
Commercial Thinning in Critical Habitat (54 acres of gaps)	May Affect and Likely to Adversely Affect Critical Habitat
Effects due to Disruption	May Affect and Likely to Adversely Affect

Magnuson-Stevens Fishery Conservation and Management Act, 1976 (MSA) – The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires the identification of habitat “essential” to conserve and enhance the federal fishery resources that are fished commercially. The Pacific Fishery Management Council (PFMC) designated Essential Fish Habitat (EFH) for Chinook, coho, and Puget Sound pink salmon in their Amendment 14 to the Pacific Coast Salmon Plan, issued September 27, 2000. The interim final rule implementing the EFH provision of the MSA (62 FR 66531) requires federal agencies to consult with the National Marine Fisheries Service for any action that may adversely affect EFH. The Goose project is located in the Upper McKenzie River Watershed, which is included in the waters designated as EFH for spring Chinook salmon by the PFMC.

Informal consultation with the National Marine Fisheries Service (NMFS) for Upper Willamette River spring Chinook salmon and Columbia River bull trout was completed during the development of the Goose EA (2009-2010). In March 2010, a final Biological Assessment was submitted to NMFS and a letter of concurrence was received March 30, 2010 concurring with the determinations in the Biological Assessment (listed above under ESA). No conservation measures were issued. During development of this FEIS, it was determined that no additional consultation was required as only minor changes were made to the proposed action, mostly being more conservative (i.e. larger no-treatment buffers).

Federal Mine Safety and Health Act of 1977, Public Law 91-173, as amended by Public Law 95-164. Development of Rock Quarries would conform to the requirements of the act, which sets forth mandatory safety and health standards for each surface metal or nonmetal mine. The purpose for the standards is to protect life by preventing accidents and promoting health and safety.

Inventoried Roadless Areas and Wilderness –No inventoried roadless areas or designated wilderness is within or adjacent to the project area

Prime Farmland, Rangeland, and Forestland – No prime farmland, rangeland, or forestland occurs within the project area.

Survey and Manage Species – The action alternatives comply with the Northwest Forest Plan as amended by the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Pre-disturbance surveys were conducted and site management applied consistent with the January 2001 species list.

Management Indicator Species (Aquatic) – The Willamette Forest Plan recognized anadromous and resident salmonids as economically important species and designated them as management indicator species for riparian habitat and water quality. The most common salmonid sport fish that occur on the McKenzie River Ranger District are spring Chinook salmon, bull trout, rainbow trout, and coastal cutthroat trout. The Goose project would maintain and improve habitat conditions for aquatic Management Indicator Species in the project area. Therefore, the Goose project would not contribute to a negative trend in viability of these species.

Management Indicator Species (Terrestrial)– The Willamette Forest Plan recognized elk and deer as economically important species that are commonly hunted, and designated them as management indicator species for winter range. Designated management indicator species for old growth and mature conifers are pileated woodpecker, marten, and northern spotted owl. The bald eagle was selected as a management indicator species for old growth conifers near large bodies of water, and the peregrine falcon was selected as a management indicator species for cliff nesting habitat. The Goose project would maintain habitat conditions for elk, deer, pileated woodpeckers, marten, bald eagles and peregrine falcons in the project area. The Goose project would not contribute to a negative trend in viability for any of the terrestrial wildlife management indicator species.

Executive Orders 11988 and 11990: Floodplains and Wetlands – Executive Order 11988 requires government agencies to take actions that reduce the risk of loss due to floods, to minimize the impact of floods on human health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. Proposed harvest treatments would not occur within 100-year floodplains. Executive Order 11990 requires government agencies to take actions that minimize the destruction, loss, or degradation of wetlands. Streamside riparian areas, seeps, springs, and other wet habitats exist in the project area. These areas would be either avoided, or managed according to the amended Willamette Forest Plan Standards and Guidelines. Riparian Reserves would also be protected with design features. As a result, proposed treatments would be consistent with Executive Orders 11988 and 11990.

Executive Order 12898: Environmental Justice – Executive Order 12898 requires that federal agencies adopt strategies to address environmental justice concerns within the context of agency operations. With implementation of either action alternatives, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations. Nearby communities would mainly be affected by economic impacts connected with contractors implementing harvest, road reconstruction, tree thinning, planting, and other fuels treatment activities. Racial and cultural minority groups could also be prevalent in the work forces that implement activities. Contracts contain clauses that address worker safety.

Executive Order 12962: Recreational Fishing – The June 7, 1995, Executive Order requires government agencies to strengthen efforts to improve fisheries conservation and provide for more and better recreational fishing opportunities, and to develop a new policy to promote compatibility between the protection of endangered species and recreational fisheries, and to develop a comprehensive Recreational Fishery Resources Conservation Plan. Proposed activities in the project area would promote the restoration of riparian function in stands in corridor and headwater aquatic reserves and to develop additional large wood to stream reaches that currently lack adequate amounts. This would improve fish habitat and would provide better future fishing opportunities for the public.

Executive Order 13186: Migratory Birds – Migratory birds are protected under the Migratory Bird Treaty Act of 1918 (16 U. S.C. 703-704). The U.S. Fish and Wildlife Service is the lead federal agency for managing and conserving migratory birds in the United States. However, under Executive Order (EO) 13186, all federal agencies are charged with the conservation and protection of migratory birds. A Memorandum of Understanding (MOU 2008) between the Forest Service and U.S. Fish and Wildlife Service requires, during NEPA planning, that the FS, to the extent practical, evaluate and balance long-term benefits of projects to migratory birds against any short- or long-term adverse effects. It also requires the FS to consider approaches, to the extent practical, for identifying and minimizing take of migratory birds that is incidental to otherwise lawful activities. Region 6 has compiled some information to assist biologists in disclosing effects to avian species during NEPA planning (Forest Service and Bureau of Land Management 2013). Effects to FS sensitive birds, federally ESA listed birds, birds that are Management Indicator Species and migratory bird species that have been identified by USFWS as Species of Conservation Concern in the Northern Pacific Forest (USFWS 2008) and that have habitat in the proposed treatment units are addressed in Chapter 3.

Seasonal restrictions are recommended in the Goose design features (Table 13) to conduct hazard tree falling outside the critical nesting season, as well as tree felling, yarding and prescribed unit underburning on specific units to protect owls. This would minimize disturbances to nesting migratory birds and reduce the likelihood of harm to individual birds. Design features to retain existing snags where possible, and to retain live trees, create snags, and fall trees for dead wood sources would provide structural features migratory birds would use. There is a design feature (Table 13) to consider late winter or fall for prescribed underburning which would reduce impacts to nesting birds and their young.

Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation – August 17, 2007, Executive Order requires Federal agencies “to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.” The proposed creation and enhancement of early seral habitat in both action alternatives in the project area would improve forage for game species and provide better hunting opportunities for the public.

Other Jurisdictions – There are a number of other agencies responsible for management of resources within the project area. The Oregon Department of Fish and Wildlife is responsible for management of fish and wildlife populations, whereas the Forest Service manages the habitat for these animals. The Oregon Department of Fish and Wildlife has been contacted regarding this analysis and Brian Wolfer, a biologist with the agency, attend a 2014 public meeting.

Proposed harvest treatments within riparian areas have been designed to comply with “Sufficiency Analysis for Stream Temperature – Evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards” (USDA Forest Service and USDI BLM, 2004). This document was prepared in collaboration with Oregon Department of Environmental Quality and United States Environmental Protection Agency to provide documentation of Northwest Forest Plan compliance with the Clean Water Act with regard to state water quality standards for stream temperatures. As such, it redeems several of the Forest Service responsibilities identified in a “Memorandum of Understanding between USDA Forest Service and Oregon Department of Environmental Quality To Meet State and Federal Water Quality Rules and Regulations” (USDA Forest Service and Oregon DEQ, May 2002). The Sufficiency Analysis provides current scientific guidance for management of riparian vegetation to provide effective stream shade, including appropriate methods of managing young stands for riparian objectives other than shade, such as production of large wood for future recruitment.

Oregon Department of Environmental Quality and the Oregon Department of Forestry are responsible for regulating all prescribed burning operations. The USDA Forest Service Region 6 has a Memorandum of Understanding with Oregon Department of Environmental Quality, Oregon Department of Forestry, and the USDI Bureau of Land Management regarding limits on emissions, as well as reporting procedures. All burning would comply with the State of Oregon's Smoke Management Implementation Plan and, for greater specificity, see the memorandum of understanding mentioned above.

Segments of the McKenzie River are designated Oregon State Scenic Waterway, which is administered by the Oregon State Parks and Recreation Department. The State Scenic Waterway segments have a dual classification, with the west side of the McKenzie River classified as Scenic River Area and the east side of the river classified as Recreation River Area. Scenic Waterway Act and Commission rules require the evaluation of proposed development within ¼ mile from each side of the river. Approval for timber harvest or salvage within this scenic waterway was requested May 29, 2012 and granted by Oregon State Parks and Recreation on September 28, 2012.

Energy Requirements and Conservation Potential – Some form of energy would be necessary for projects requiring use of mechanized equipment. Commercial thinning and some partial cutting units would involve both heavy and small machines for yarding logs during the implementation period. Projects such as road reconstruction and maintenance could require heavy machinery for a small amount of time. Both possibilities would result in minor energy consumption. Alternatives that harvest trees could create supplies of firewood as a by-product, which would contribute to a supply of energy for the local community for home heating.

Appendix D – Past, Present and Reasonably Foreseeable Future Actions Relevant to the Cumulative Effects Analysis

The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

The cumulative effects analysis in this document is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

> CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR 1508.7)

The table below provides a summary of past, present, and reasonably foreseeable future actions that overlap in time and space with the Goose project and could contribute cumulative effects to the resources in the project area.

Action	Agency	Description	Resources Affected
Past Actions			
Foley Ridge Landscape Management Project (EA)	USFS	13 Thin Timber Sale Timber harvest Completed 2014 Approximately 160 Acres 13 Thin Hazardous Fuels Reduction Grapple, hand piling and burning Completed 2014 Approximately 44 acres	Vegetation, Soil, Water, Wildlife, Fisheries, Roads and Access Management, Invasive Plants

Action	Agency	Description	Resources Affected
Past Actions			
Bridge Thin Project (EA)	USFS	Eagle Timber Sale Timber harvest Completed 2014 Approximately 176 Acres Eagle Hazardous Fuels Reductions Pile and burn Completed 2014 Approximately 5 acres	Vegetation, Soil, Water, Wildlife, Fisheries, Roads and Access Management, Invasive Plants
Goose Project (EA)– Hazardous Fuel Reduction	USFS	Hazardous fuels reduction approved and implemented in units 830, 840, 970, 980/981 Completed 2014 Approximately 180 acres	Vegetation, Soil, Water, Wildlife, Fisheries, Roads and Access Management, Invasive Plants
Highway 126/242 Corridor- Hazardous Fuels Reduction	USFS	Highway 126/242 Corridor Hazardous Fuels Reduction Completed 2012 and 2013 Approximately 120 acres	Vegetation, Soil, Water, Wildlife, Fisheries, Roads and Access Management, Invasive Plants
Timber Harvest 1993-2014	USFS	Approximately 764 acres in the proposed project area have been harvested.	Vegetation, Soil, Water, Wildlife, Fisheries, Roads and Access Management, Invasive Plants
Present Actions (ongoing)			
Powerline	Eugene Water and Electric Board	Powerline runs through the project area	Vegetation, Soil, Water, Wildlife, Fisheries, Roads and Access Management, Invasive Plants, Scenery
Reasonably Foreseeable Future Actions			
Pass Thin Project (CE)	USFS	Pass Thin Timber Sale Thinning in gaps Sale in Winter 2014-2015 Approximately 21 acres	Vegetation, Soil, Water, Wildlife, Fisheries, Roads and Access Management, Invasive Plants, Scenery

Appendix E – Evaluation for Consistency with the Aquatic Conservation Strategy

Introduction

The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. A goal of this strategy is to maintain a "natural" disturbance regime. In addition, management activities must comply with nine objectives that are included in the strategy. A variety of tactics to accomplish these goals and objectives are incorporated into four primary components. These components are:

1. Riparian Reserves
2. Key Watersheds
3. Watershed Analysis
4. Watershed Restoration

These four components, along with Late Successional Reserves, are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl - USFS, BLM 1994, (ROD), pages B9-B12).

The Four Components

Riparian Reserves

The Northwest Forest Plan defined Riparian Reserves as “portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply” (ROD page B12). Riparian Reserves include those portions of a watershed directly coupled to streams, ponds, lakes, and wetlands - that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing water (ROD pgs. B-12 and B-13).

The Riparian Reserve network in the project area totals about 4,820 acres. The Watershed Analysis made no final recommendations to adjust Riparian Reserve widths for waterbodies in the watershed, retaining the initial Reserve widths (based off of local site potential tree height) from the ROD for all waterbodies.

During analysis for the Goose project, no reductions of Riparian Reserve widths along any waterbodies were proposed. However, silvicultural treatments were proposed within Riparian Reserves for some units in order to improve structural and species diversity. Timber harvest is generally prohibited within Riparian Reserves, but there are three exceptions provided in the ROD, one of which is Standard and Guideline TM-1(c):

> *Standards and Guidelines (S&Gs)*
> TM-1(c). Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

Standard and Guideline TM-1(c) in the Northwest Forest Plan (1994) provides direction on when silvicultural activities can take place in Riparian Reserves. The McKenzie River Ranger District’s task is to review all the Riparian Reserves in the project area and at both the unit and landscape levels to determine if treatment is warranted. Based on field investigations and a landscape level analysis of stand age and deciduous vegetation composition, recommendations were developed for each Riparian Reserve. Treatments within Riparian Reserves are proposed where stands are dense, overstocked, and conifer-dominant with very little structural and species diversity and understory development. This lack of complexity and diversity is outside the natural range of variability and may be limiting nutrient cycling, deciduous organic matter input to waterbodies, and habitat for riparian-dependent wildlife. In other portions of Riparian Reserves, however, there is higher structural and species diversity and riparian stands are providing adequate stream shade, root strength and bank stability, sediment filtration and nutrient cycling, large wood supply to waterbodies and floodplains, organic matter input, and habitat for riparian-dependent wildlife. Treatments were not recommended in these areas.

Key Watersheds

The Northwest Forest Plan created an overlay of Key Watersheds that are intended to provide refugia for at-risk stocks of anadromous salmonids and resident fish species. Refugia are a cornerstone of the conservation strategy for these species, consisting of watersheds that provide high quality habitat or are expected to provide habitat. Two different levels of protection, or tiers, are identified, as well as non-Key Watersheds (ROD page B19). In Key Watersheds, completion of a watershed analysis is required prior to most management activities. The project area is located within the Florence Creek-McKenzie River, Elk Creek-McKenzie River, and Lost Creek 6th Field Sub-watersheds. Only Lost Creek is a Key Watershed. One of the important components of Key Watershed is that there must be no net gain in roads. However, no new permanent roads are proposed with this project

Watershed Analysis and Watershed Restoration

The Upper McKenzie Watershed Analysis (WA) was prepared for the McKenzie River Ranger District in 1995. The watershed was characterized in terms of past and current conditions, and a synthesis discussion was provided to guide development of management proposals to maintain and restore watershed conditions.

The Goose project has incorporated information from the WA into the project design. Current vegetative landscape patterns reflect past management activities that did not consider what the landscape might look like under natural disturbance regimes. Many of the proposed actions seek to create vegetative patterns, late successional stand structure, and fuel loading that would have been typical of this landscape under the natural disturbance regimes that historically occurred in the area.

Aquatic Conservation Strategy Objectives

The previous discussions highlighted the consistency of the Goose project with the four components of the Aquatic Conservation Strategy. The management objective for Riparian Reserves in the project area is to acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy (ACS) Objectives as directed in the Northwest Forest Plan. This section will outline how the activities proposed in the alternatives conform to the nine objectives. The information presented is summarized from Chapters 2 and 3 of the Environmental Impact Statement, where greater detail can be found.

In some cases, maintaining and/or restoring each one of the ACS Objectives can be a balancing act with trade-offs. For example, to meet the riparian vegetation objectives (“species composition and structural diversity of plant communities” and “habitat to support well distributed populations of native plant, invertebrate and vertebrate riparian dependent species”) in young, dense conifer stands, a common silvicultural tool is to remove overstory density to encourage understory growth and structural development. Removal of overstory density, however, could potentially lead to increased thermal loading or reduction of wood volume available for recruitment if not designed correctly for the specific site. Because of these trade-offs, the McKenzie River Ranger District's interdisciplinary team carefully balance conflicting objectives based on characteristics of each waterbody and adjacent riparian area. Based on data gathered through landscape and stream reach assessments current conditions in some portions of the Riparian Reserves are outside the natural range of variability and are not meeting desired vegetation characteristics needed to attain ACS Objectives. Therefore, there is a need to manage certain parts of Riparian Reserves. Other areas, however, are currently meeting desired vegetation characteristics and management is not necessary.

Objective #1 - Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Alternative 1 (No Action) – This alternative would maintain landscape complexity at the current condition. Several hundred acres of Riparian Reserves would remain as dense, overstocked, conifer-dominant stands with very little structural and species diversity and understory development until natural processes create openings and down wood. This could take several decades. Waterbodies would continue to experience low volume and small size classes of in-stream wood but would maintain upland down wood numbers.

Alternative 2 (Proposed Action) – Proposed treatments would occur on 138 acres and are designed to accelerate the development of: (1) early-seral forest, which has been declining in the watershed as a result of fire suppression and historic land management, (2) older forest structure (e.g. large trees, large dead trees, spatial structure and compositional heterogeneity, etc.), which was dramatically reduced in the last century by historic land management, and (3) a greater abundance of deciduous and herbaceous species, which have subsequently declined with the loss of early- and late-seral forest. Though no regeneration harvest is proposed within Riparian Reserves, upland regeneration treatments would enhance early-seral habitat within the watershed and the overall diversity and complexity across the landscape. Treatments to accelerate late forest structure are proposed within some portions of Riparian Reserves. These thinning treatments were designed to emulate, to the extent possible, conditions under a natural fire regime. Primary shade and wood recruitment zones would be protected on every waterbody and existing high quality habitat within Riparian Reserves would be maintained within no-treatment buffers. The objective is to provide a balance between the maintenance of existing habitat for species, populations, and communities, with opportunities to develop landscape scale features with distribution, diversity and complexity of the historical landscapes. This includes aquatic and riparian elements of the landscape. Approximately 138 acres of Riparian Reserves are proposed for active treatment rather than passive restoration.

Additionally, about 4,140 acres of Riparian Reserves throughout the project area would remain untreated - over 96 percent.

Alternative 3 – The effects of Alternative 3 would be similar to Alternative 2 with the exception that only about 57 acres would be treated. Fewer acres would be treatments outside the Riparian Reserves and there would be no early-seral creation.

Objective #2 - Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Alterative 1 (No Action) –Failing culverts and inadequately maintained roads would continue to affect the ability of some aquatic species to disperse. Otherwise, implementation of this alternative would maintain existing spatial and temporal connectivity.

Alterative 2 (Proposed Action) – Riparian Reserves, as established by the Record of Decision for the Northwest Forest Plan and re-assessed in the Upper McKenzie Watershed Analysis have been incorporated into the design of all treatment units where waterbodies occur. Active treatments are proposed within Riparian Reserves on approximately 138 acres where they have the potential to enhance functions such as the development of future large wood, stand structural diversity, vegetative species richness and diversity, and other late- successional characteristics. Road treatments include upgrades of stream crossings to accommodate 100-year flood events so that these events can flow through the landscape unimpeded and without the risk of catastrophic fill failures and provide for better aquatic organism passage. Stream-adjacent riparian corridors would be maintained through no-treatment buffers and outer portions of some Riparian Reserves would be treated to improve late forest structure for wildlife.

Alternative 3 – Implementation of this alterative incorporates many of the same elements as Alternative 2. Fewer culverts would be upgraded though most of these are on intermittent streams high up on the slopes where fewer aquatic species reside. Also 81 fewer acres of riparian thinning would occur.

Objective #3 - Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Alternative 1 (No Action) – Implementation of this alternative would maintain existing conditions. Roads and drainage features would continue to fail creating potential for damage to channel integrity. Large in-stream wood levels in plantations would remain low for several decades until natural processes occurred to create it. Small wood levels would remain at normal to high levels as the stands develop. The ability of some streams to store gravels and fine sediment would be greatly reduced during this time which would continue to affect channel morphology.

Alterative 2 (Proposed Action) – All proposed treatments were designed with channel stability in mind. All harvest activities minimize the use of ground disturbing equipment in and around waterbodies, and provide for retention of all vegetation that is contributing to the stability of banks and channels. Where aerial yarding methods are prescribed, full suspension is required when yarding over perennial streams to prevent disturbance of stream banks and channels. Trees cut for skyline corridors would be retained on site as down woody material.

Roads are a known potential source of damage to stream habitat, where improper design or location, or inadequate maintenance results in failures or roadway erosion. The Goose project addresses this concern by upgrading numerous culverts. Approximately 43 miles of maintenance and reconstruction of portions of the existing road network that are in poor condition, replacement of undersized or old culverts, drainage improvement, and application of aggregate where necessary would reduce chronic, low amplitude sources of fine sediment from the existing transportation system, and the potential of crossing fill failures. This would reduce the possibility of gravels and cobbles becoming embedded in fine materials in the stream channel bottoms. The majority of temporary roads would be located on ridge tops or gentle slopes or utilize previously disturbed locations not decommissioned with historic logging. Approximately 6.9 miles of temporary roads would be constructed on stable locations, and all of these would be obliterated following harvest activities. Those segments located within the Riparian Reserves would be located well outside of the primary shade zone or cross perpendicular to the stream. Approximately 0.85 miles of temporary roads are proposed within the Riparian Reserves which is approximately 4 acres of ground disturbance. There are five proposed temporary road crossings which are needed to access portions of units. Typical rates of revegetation start occurring within two decades from natural regeneration if the stand is not scheduled for replanting.

Alterative 3 – Implementation of this alternative would have similar effects as Alternative 2 with the exception of fewer road miles maintained (only 26 miles) which may result in impacts to the streams along other roads. Fewer miles of temporary roads (only 2.2 miles) are proposed, and only about 0.46 miles (about 2 acres) of those are within the Riparian Reserves.

Objective #4 – Maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Alterative 1 (No Action) – Implementation of this alternative would maintain existing water quality conditions including current levels of shade for stream temperatures. Full water quality recovery could take several years to several decades in streams hit heavily by historic logging (clear-cutting to the stream edge) and stream “cleaning” (removal of in-stream wood).

Alternative 2 (Proposed Action) – Approximately 138 acres of Riparian Reserves are proposed for active treatment. Implementation of this would do nothing to immediately improve water quality. However, a primary objective of any treatment within the Riparian Reserves is to maintain compliance with the Regional Total Maximum Daily Load (TMDL) Implementation Strategy so that stream temperatures are not detrimentally impacted. Over 4,140 acres of Riparian Reserves throughout the project area would remain untreated. Where vegetative treatments are proposed within Riparian Reserves, effective stream shading is retained at levels sufficient to maintain water temperature. A minimum of 50 percent canopy closure (approximately 40 percent canopy cover) is preserved throughout the Riparian Reserve to help p0rotect the secondary shade zone and the maintain microclimates. No-harvest buffers were developed to preserve the primary shade zone, and most of the Class 3 streams and perennial waterbodies have a minimum 60-foot no-harvest buffer based off of slope, vegetation size, and stream width. For a list of Design Features that protect water quality, refer to Table 13.

Alternative 3 – Implementation of this alternative would have similar effects as Alternative 2. Design features for protecting stream-side shade and water quality is the same though there are 81 fewer acres proposed for thinning in Alternative 3. As with Alternative 2, treatments have been designed to comply with the Northwest Forest Plan Temperature TMDL Implementation Strategy.

Objective #5 – Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Alterative 1 (No Action) – Large portions of the project area have not been previously logged which helps provide for landscape processes that are dominated by nature rather than humans. Implementation of this alternative would maintain existing anthropogenic sediment input at their current levels for potentially several years. However, Alternative 1 would not correct existing road erosion problems nor reduce the risk of future road or culvert failure.

Alternative 2 (Proposed Action) – Project related activities are intended to maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations, as discussed above under ACS Objective #3. These elements would also provide protection of water quality from the introduction of sediment into streams.

Roads are a known potential source of damage to stream habitat, where improper design or location, or inadequate maintenance results in failures or roadway erosion. The Goose project addresses this concern by upgrading numerous culverts and ensuring no new permanent road construction. Approximately 43 miles of maintenance and reconstruction of portions of the existing road network that are in poor condition, replacement of undersized or old culverts, drainage improvement, and application of aggregate where necessary, would reduce chronic, low amplitude sources of fine sediment from the existing transportation system, and the potential of crossing fill failures. This would reduce the possibility of gravels and cobbles becoming embedded in fine materials in the stream channel bottoms. During culvert replacement, some sediment may enter the stream system. However, the amount would be minimized by following Best Management Practices (BMPs), and the impact to the aquatic ecosystem would be relatively short lived (1-2 seasons) and only a few yards downstream. Approximately 6.9 miles of temporary roads would be constructed on stable locations, and all of these would be obliterated following harvest activities. Approximately 0.85 miles of temporary roads are proposed within the Riparian Reserves which is approximately 4 acres of ground disturbance.

All proposed treatments were designed with sediment transport potential in mind. All harvest activities follow BMP guidelines and restrict the use of ground disturbing equipment in and around streams. This reduces the potential of water routing along skid roads and overland flow due to high compaction levels. Where aerial yarding methods are prescribed, full suspension is required when yarding over perennial streams to prevent disturbance of stream banks and channels. Trees cut for skyline corridors would be retained on site as down woody material.

Alternative 3 – Implementation of this alternative would have similar effects as Alternative 2 with the exception of fewer road miles maintained or reconstructed. This may result in impacts to the streams along roads not repaired. Fewer miles of temporary roads (only 2.2 miles) are proposed, and only about 0.46 miles (about 2 acres) of those are within the Riparian Reserves.

Objective #6 – Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration and spatial distribution of peak, high, and low flows must be protected.

Alterative 1 (No Action) – Large portions of the project area remain unlogged. This helps provide for landscape processes that are dominated by nature rather than humans. Implementation of this alternative would maintain existing in-stream flows.

Alternative 2 (Proposed Action) – This alternative maintains current canopy cover at levels well above the maximum mid-point Aggregate Recovery Percentage (ARP). Therefore, no altered flows are anticipated from implementation of this alterative.

Alternative 3 – Implementation of this alternative would have similar effects as Alternative 2, and no altered flows are anticipated.

Objective #7 – Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Alterative 1 (No Action) – As mentioned in previous objective, large portions of the project area remain unlogged which helps provide for natural landscape processes. Implementation of this alternative would maintain existing floodplain inundations and water table elevations.

Alternative 2 (Proposed Action) – Implementation of a landscape design that is intended to restore vegetative structures within young dense stands, landscape patterns, and disturbance regimes to a more natural condition would result in watershed conditions that more closely resemble those under which historic stream flow conditions developed.

Floodplains and wetland areas were excluded from consideration for harvest activities and where treatment units occur adjacent to these features, ground based equipment that could impact the soil and result in altered groundwater movement are restricted.

Alternative 3 – Implementation of this alternative would have similar effects as Alternative 2.

Objective #8 - Maintain and restore the species compositions and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distribution of coarse woody debris sufficient to sustain physical complexity and stability.

Alternative 1 (No Action) – This alternative would maintain landscape complexity at the current condition. Over a hundred acres of Riparian Reserves would remain in dense homogenous stand conditions until natural processes created openings in which hardwoods and understory species could thrive. This could take several decades. Some habitats would continue to experience low volumes of large in-stream and terrestrial down wood. However, small wood levels would remain at normal to high levels as stands develop.

Current rates of large wood recruitment, provided mostly by stem mortality (from competition, disease, wind and snow downed trees) and bank erosion, would be maintained. Alternative 1 would provide a slightly higher rate of in-stream wood recruitment compared to the action alternatives. Where the action alternatives protect about 90 percent of the wood recruitment zones, the No-Action alternative would protect 100 percent. In some streams, recruitment trees are of sufficient size to meet ACS Objectives, but in other streams with small diameter riparian stands the aquatic benefit is limited, namely through the reduced ability to store sediment and organic matter and contribute to habitat forming processes (e.g. scour). Though small wood has some value, particularly in the smaller headwater reaches, the longevity of recruited small diameter trees is short-lived, as they break down through abrasion and decomposition more rapidly compared to large trees. Small diameter trees are also more likely to be transported out of the system. In-stream wood abundance is low for most streams in the project area and is largely due to the lack of large enough wood to remain stable in channels.

The No-Action alternative would not accelerate desired vegetation conditions. Desired riparian conditions – high species and structural diversity with large dead and down wood – would slowly develop over time (several decades) and depend solely on natural thinning events (stem exclusion mortality and disturbance). Without management to increase the abundance of deciduous and herbaceous vegetation in dense, conifer-dominant stands, ecosystem productivity would remain at relatively lower levels. Accelerated restoration of riparian stands that currently do not meet ACS Objectives would not be accomplished. In addition, the currently dense riparian stands would be at greater risk to high severity fire, insect infestation, and disease – all carried more efficiently through overstocked stands. A large disturbance event has the potential to reduce vegetation, large woody material, and stream shade across large areas of Riparian Reserves.

Alternative 2 (Proposed Action) – Alternative 2 would commercially thin 138 acres of Riparian Reserves to reduce the density of overstocked riparian stands, increase species diversity and structural complexity, and accelerate tree growth. Selected streams were chosen for their vegetation characteristics at the stream catchment scale and at the stream reach scale.

This activity would have the short term effect (years to a couple of decades) of reducing coarse woody material loading in the Riparian Reserve outside the no-harvest buffer. To develop stream-specific riparian treatments that attain this objective, large woody material (LWM) source areas were calculated at various distances from each stream channel in each unit. LWM recruitment zones and associated no-treatment buffers were defined based on effective tree heights. Protecting at least 90 percent of potential wood inputs would maintain ACS Objectives related to in-stream wood while allowing for treatments to improve vegetation diversity and accelerate the growth of future in-stream wood. Where management is recommended inside those zones, dead and down wood objectives would be met through supplemental fall-and-leave treatments. Overall, LWM values would remain within the range of natural variability, and abundant overstory would be retained for future wood input sufficient to sustain physical complexity.

In many cases where vegetation objectives were already being met, no silvicultural treatments were proposed with Riparian Reserves.

The actual wetlands and floodplain areas that are critical to nutrient filtering are eliminated from treatment areas and use of ground disturbing equipment adjacent to them is restricted.

Use of low severity fire to reduce fuel loading and wildfire risk is restricted to the edges of Riparian Reserves where the risk of adverse effects on ground cover and duff retention cannot impact water quality and nutrient availability.

The majority of temporary roads would be located on ridge tops or gentle slopes or utilize previously disturbed locations not decommissioned with historic logging. Those segments located within the Riparian Reserves would be located well outside of the primary shade zone or cross perpendicular to the stream. Approximately 0.85 miles of temporary roads are proposed within the Riparian Reserves. This is approximately 4 acres of ground disturbance. There are five proposed temporary road crossings which are needed to access portions of units. Impacts to large wood are expected to be similar to those of thinning treatments. Typical rates of revegetation start occurring within two decades from natural regeneration if the stand is not scheduled for replanting.

Over 4,140 acres of Riparian Reserves throughout the project area would remain untreated and provide landscape-scale diversity. The impact of thinning on the long-term riparian forest structure and wood recruitment would be minor at the watershed scale, but would have positive impacts at the project scale. Aquatic habitats currently characterized as simplified may be expected to improve in substrate storage and habitat complexity over time thus improving their ability to meet aquatic life history needs at the site scale. In summary, any proposed management of Riparian Reserves in Alternative 2 would not deter attainment of and would largely benefit ACS Objectives.

<u>Alternative 3</u> - Implementation of this alternative would have similar effects as Alternative 2 with the exception there are fewer acres (81 acres less) proposed for thinning in Alternative 3. Fewer miles of temporary roads (only 2.2 miles) are proposed, and only about 0.46 miles (about 2 acres) of those are within the Riparian Reserves.

<u>Objective #9</u> – Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

<u>Alternative 1 (No Action)</u> – This alternative would maintain current habitat conditions for both aquatic and riparian-dependent species. Many of the aquatic and riparian-dependent species need complex stand structures like those found in old-growth stands in order to thrive while others need younger seral stages. However, several hundred acres of Riparian Reserves would remain in dense homogenous stand conditions until natural processes created openings in which hardwoods and understory species could

thrive. This could take several decades. Meanwhile aquatic and terrestrial habitats would continue to experience low volumes of large down wood and a lack of deciduous leaf litter in many stands.

Alternative 2 (Proposed Action) – Approximately 138 acres of Riparian Reserves are proposed for active treatment rather while over 4,140 acres of Riparian Reserves throughout the project area would remain untreated and provide landscape-scale diversity. In addition, this project complies with the Northwest Forest Plan and all of its applicable standards and guidelines. Objective #9 is expected to maintain and restore late-successional and old-growth forest ecosystems, and provide adequate viability levels for all late successional species including species listed in the FSEIS ROD Table C-3. As discussed in the other Objectives above, some stands in Riparian Reserves are proposed for treatment to encourage development of large wood and late successional stand structure and species diversity. This would help to create a rich variety of habitats for native species. Adequate amounts of down woody debris would be retained on site.

The McKenzie River and its numerous tributaries provide excellent habitat for native fish. This is due to the cold, clean water and the gravels produced from the tributary streams. The alternative is designed to maintain or enhance these attributes. Additionally, upgrades to several culverts would provide better dispersal opportunities to aquatic invertebrates and salamanders.

Alternative 3 - Implementation of this alternative would have similar effects as Alternative 2 with the exception that Alternative 3 proposes fewer acres (81 acres less) of Riparian Reserve thinning and fewer miles of road maintenance/repairs (only 26 instead of 43 miles).

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Appendix F – Effects to Known Owl Sites

Alternative 2

Effects of Suitable Habitat Removed to Known NSO Sites

Removal of suitable habitat *may affect, and is likely to adversely affect* (direct and indirect), spotted owls because such harvest would remove suitable habitat and therefore decrease the amount of nesting, roosting, and foraging habitat for an owl pair.

There are no known or predicted spotted owl sites within 1.2 miles of unit 420 (27 acres). Goose units 471, 691, and 720 are within the home ranges of three known sites: MSNO 2035, MSNO 0835 and MSNO 2825.

Silviculturally, these stands have reached the stand competition stage and are currently at the Culmination of Mean Annual Increment, which is required by law before regeneration of a stand can occur on federal lands. Competition creates stand stress and makes them susceptible to insect and disease outbreaks. The silvicultural prescription would not be a conventional clear-cut treatment. The objective would be to leave 15-30 green trees per acre in both scattered pockets as well as scattered throughout the stand post-harvest. These retention trees would be released to grow and to encourage development of large trees, snag creation, diversity in future stand structure, and development of future large down woody debris. In 30 to 50 years, the stand structure is expected to be more complex and more closely mimic late successional forests than what the current stand is projected to produce in the same time frame if left on its current trajectory.

MSNO 0835: The latest data from this site is a resident single northern spotted owl found in 1990. A 100 acre Late Successional Reserve (LSR) is established around this site. This site is currently deficient in suitable habitat in both the core area (40 percent) and home range (31 percent). About 50 percent of this site is in either private land (16 percent) or in non-habitat status (34 percent). The BioMapper model, used in the ten-year report for the Northwest Forest Plan (Davis and Lint 2005), models suitable habitat on private and non-forest land. It shows about 39 acres of suitable habitat on private land. This increases to total percent of suitable habitat within the home range of this site by only 2 percent (from 31 percent to 33 percent).

Ten acres of suitable habitat in Unit 690 falls within the home range of this site. It is the determination of the unit biologist that this is a marginal site at best. Therefore this site may only marginally contribute to reproduction as demographic studies have shown correlation between lack of suitable habitat within the home range and unsuccessful breeding (USFWS et al. 2008).

The proposed harvest would reduce canopy closure to 20 percent thereby removing 10 acres of suitable habitat in this known site. This activity *may affect and is likely to adversely affect* and harm the northern spotted owls at this known site since suitable habitat would be removed from a site that currently has limited suitable habitat, thereby increasing the amount of time it would take for this home range to return to optimal level (USFWS 2009, p.77-78).

MSNO 2035: The most recent data for this site is a nesting pair from 2004. This known site is currently above suitable habitat threshold levels in the core area (68 percent) and home range (53 percent). A 100-acre Late Successional Reserve (LSR) was established around this site. Eleven acres of suitable habitat in Unit 471 fall within the home range of MSNO 2035. The proposed harvest would reduce canopy closure to 20 percent, which would modify these eleven acres of suitable into non-habitat. After treatment, this known site would have suitable habitat above the 50 percent threshold in the core area, but just under the

50 percent suitable habitat within the home range (49 percent) which indicates that this site may become unstable. Therefore, this activity *may affect and is likely to adversely affect* this known site by removing suitable habitat. However, it is not expected to harm this known site (USFWS 2009, p.78).

MSNO 2825: The latest data for this site was a non-nesting pair located in 1991. A 100-acre LSR was established adjacent to this site. About 32 percent of the home range of this site is located in LSR (100-acre LSR 2825 and large LSR RO218). About 28 percent is currently on private land (1 percent) or in non-habitat status (27 percent). Units 720 and 691 would remove 23 acres of suitable habitat within the 0.5 mile core area and an additional 14 acres in the 1.2 mile home range. Therefore, proposed removal of 37 acres of suitable habitat *may affect and is likely to adversely affect* MSNO 2825 due to habitat loss. However, it is not expected to harm this known site since it is expected to remain viable after treatment, with suitable habitat above thresholds in both its core area and home range (USFWS 2009, p.78).

Effects of Dispersal Habitat Removed to Known NSO Sites

Removal of dispersal habitat *may affect, but is not likely to adversely affect* (direct and indirect), spotted owls (unless it is within the nest patch of a known or predicted owl site) because, even though dispersal habitat would be eliminated on these acres, sufficient habitat would remain in the area to facilitate owl dispersal which is the case for all proposed Goose project units (USFWS 2009).

There are nine units within the Goose project that would remove 371 acres of dispersal habitat to a post-harvest canopy closure of 30 percent for the purpose of enhancing big game forage. These are fast growing stands and are expected to increase in canopy closure by about 2 percent per year, achieving dispersal habitat again in 5-6 years after harvest.

These nine units are: 60, 70, 620, 640, 650, 710, 750, 760, and 770. They fall within the five owl home ranges discussed below, two of which are deficient in amount of suitable habitat within their home ranges (MSNO 0835 and MSNO 2034).

MSNO 0835: This known site represents a resident single northern spotted owl found in 1990. A 100 acre Late Successional Reserve (LSR) was established around this site. This site is currently deficient in suitable habitat in both the core area (40 percent) and home range (33 percent). About 50 percent of this site is in either private land (16 percent) or in non-habitat status (34 percent). The BioMapper model (Davis and Lint 2005) shows about 39 acres of suitable habitat on private land as of 2005, but this is not sufficient to help create a viable site. Unit 620 (51 acres) falls within the home range of this site.

It is the determination of the unit biologist that this is a marginal site at best and by locating dispersal habitat removal projects in marginal sites, overall adverse effects to northern spotted owls would be minimized. The proposed harvest would reduce marginal dispersal habitat canopy closure to 30 percent, but since dispersal is not limiting in the area and the stand is not contributing to suitable foraging habitat for this home range, this part of the proposed action *may affect but is not likely to adversely affect* northern spotted owls.

MSNO 0836: This site contains a nesting pair (2004) and has an associated established 100 acre Late Successional Reserve (LSR). Current suitable habitat acreages are above threshold levels for the core area (54 percent) and the home range area (61 percent). Five acres of unit 770 are within the core area (0.5 miles), the remainder of unit 770 along with units 750 and 760 (115 acres) are within the home range (1.2 miles). The proposed removal of 120 acres of dispersal habitat to a 30 percent canopy closure *may affect but is not likely to adversely affect* northern spotted owls as the stand is not contributing to suitable foraging habitat for this home range and dispersal habitat is not limited in the area.

MSNO 2034: The latest data for this site shows a 2004 nesting pair. A 100 acre Late Successional Reserve (LSR) has been established around this site. This site is currently deficient in suitable habitat in both the core area (49 percent) and home range (35 percent). About 24 percent of this site is in non-habitat status. Units 60 (10 acres) falls within the core (0.5 miles) and unit 70 (22 acres) falls within the home range of this site. The proposed harvest would reduce marginal dispersal habitat canopy closure to 30 percent in the short term and *may affect but is not likely to adversely affect* northern spotted owls.

MSNO 2825: The latest data for this site was a non-nesting pair located in 1991. A 100-acre LSR was established adjacent to this site. About 32 percent of the home range of this site is located in LSR (100-acre LSR 2825 and large LSR RO218). About 28 percent is currently on private land (1 percent) or in non-habitat status (27 percent). Units 620, 640, 650, 710, 750,760 and 770 would remove 340 acres of dispersal habitat within the home range. After treatment, this known site would remain above optimal levels of suitable in both its core area (58 percent) and home range (52 percent) and dispersal is not limiting in the area. Therefore, proposed removal of 340 acres of dispersal habitat *may affect but is not likely to adversely affect* northern spotted owls.

MSNO 2836: This non-nesting pair from 1999 has an established 100-acre Late Successional Reserve (LSR). About 22 percent of this home range in is non-habitat status. Unit 60 would treat about one acre of dispersal within this home range. This proposed treatment *may affect but is not likely to adversely affect* this known owl site since dispersal is not limiting in the area and the stand is not contributing to suitable foraging habitat for this home range.

Effects of Harvest Habitat Downgraded to Known NSO Sites

Harvest Habitat Downgrade in suitable habitat *may affect, and is likely to adversely affect*, the spotted owl because such thinning would modify northern spotted owl suitable habitat to the extent that it no longer serves the function of nesting, roosting and foraging. It may, however, continue to function as dispersal habitat (USFWS 2009).

There are nine units within the Goose project that would downgrade 331 acres of suitable habitat to a post-harvest canopy closure of 40 percent. These units are: 300, 320, 330, 380, 450, 470, 480, 680, and 690. These units fall within five owl home ranges, two of which are deficient in suitable habitat within their home ranges: MSNO 0835 and MSNO 2034.

MSNO 0835: This known site represents a resident single northern spotted owl found in 1990. A 100 acre Late Successional Reserve (LSR) was established around this site. This site is currently deficient in suitable habitat in both the core area (40 percent) and home range (33 percent - includes 39 acres of suitable habitat on private land from BioMapper). About 50 percent of this site is in either private land (16 percent) or in non-habitat status (34 percent). Portions (totaling 2 acres) of Units 680 and 690 fall within the home range of this site.

It is the determination of the unit biologist that this is a marginal site at best and by locating suitable habitat downgrading projects in marginal sites, overall adverse effect to northern spotted owls would be minimized. However, the proposed harvest would downgrade suitable habitat by reducing canopy closure to 40 percent and therefore *may affect and is likely to adversely affect and harm this spotted owl site by reducing already limited suitable owl habitat.*

MSNO 2034: The latest data for this site shows a 2004 nesting pair. A 100 acre Late Successional Reserve (LSR) has been established around this site. This site is currently deficient in suitable habitat in both the core area (49 percent) and home range (35 percent). About 24 percent of this site is in non-habitat status.

A portion of units 300 (47 acres) and units 320 and 330 (50 acres) falls within the home range of this site. The proposed harvest would reduce suitable habitat to a canopy closure of 40 percent. This downgrading of suitable habitat to dispersal would reduce the already limited suitable owl habitat at this site and therefore *may affect and is likely to adversely affect and harm this spotted owl site.*

MSNO 2035: The most recent data for this site is an evening pair from 1997. This site currently has sufficient suitable habitat both within the core area (68 percent) and the home range (53 percent) to be considered a stable site. A 100 acre Late Successional Reserve (LSR) was established around this site. A portion of unit 450 (7 acres) and units 470 and 480 (105 acres) fall within the home range of MSNO 2035.

The proposed harvest would downgrade suitable habitat to dispersal habitat by reducing the canopy closure to 40 percent. This would not affect the percentage of suitable within the 0.5 mile core area, but would reduce the percentage of suitable habitat within the 1.2 mile home range to 49 percent, which would change it to an “unstable” site (with < 50 percent suitable but ≥ 40 percent suitable within the home range). However, this difference in amount of suitable would not rise to the level of harm (< 40 percent suitable habitat within the home range). Therefore, this activity *may affect and is likely to adversely affect* northern spotted owls because suitable habitat would be removed, but because sufficient suitable habitat remains for this owl site after treatment, this site is not expected to be harmed by the proposed action.

MSNO 2825: The latest data for this site was a non-nesting pair located in 1991. A 100-acre LSR was established associated to this site. About 32 percent of the home range of this site is located in LSR (100-acre LSR 2825 and large LSR RO218). About 28 percent is currently on private land (1 percent) or in non-habitat status (27 percent). Units 680 and 690 would reduce 27 acres of suitable habitat to a 40 percent canopy closure within the home range. After treatment, this known site would remain above stable threshold levels of suitable in both its core area and home range. Proposed removal of 27 acres of suitable habitat *may affect and is likely to adversely affect* northern spotted owls by removing suitable habitat, but this site is not expected to be harmed by such action.

MSNO 3963: The most recent data for this site is a day-time resident single from 1991. The amount of suitable habitat at this site is sufficient to support a stable owl pair, with 79 percent suitable habitat in the core area and 65 percent suitable in the home range. A portion of unit 470 (18 acres) falls within the home range of this site. The proposed harvest would downgrade suitable to dispersal habitat by reducing the canopy closure to 40 percent. However, this site is expected to remain stable after harvest, with 79 percent suitable in the core area and 64 percent suitable in the home range. Therefore, this activity *may affect and is likely to adversely affect* northern spotted owls by removing suitable habitat, but this site is not expected to be harmed by such action.

Effects of Harvest Habitat Maintained to Known NSO Sites

Harvest Habitat Maintained may affect but is not likely to adversely affect the spotted owl both directly and indirectly because current spotted owl habitat would be maintained. In the Biological Assessment for the Goose project, only dispersal habitat would be treated under this activity (USFWS 2009).

1351 acres of a dispersal harvest habitat maintained treatment is proposed, that would result in a post-harvest canopy closure of at least 40 percent. Table 34 displays known sites that have home ranges that overlap these treatment units. There are no predicted sites in the Goose project. However, no dispersal habitat would be reduced with the “harvest habitat “maintained treatments. These treatments in dispersal habitat stands are *may affect but are not likely to adversely affect* spotted owls (USFWS 2009).

Effects of Underburn to Known NSO Sites

Underburning *may affect and is likely to adversely affect* spotted owls both directly and indirectly since suitable habitat is expected to be downgraded to dispersal habitat. In dispersal, underburning *may affect but is not likely to adversely affect* (direct) spotted owls because although dispersal habitat may be removed, dispersal is not limiting in the area (USFWS 2009).

Three underburn units are proposed in the Goose project. The intent of these treatments is to return fire to the ecosystem. Units 800, 810, and 820 totaling 75 acres are currently functioning as suitable spotted owl habitat. The return of fire to these stands is expected to downgrade the habitat to a 40 percent canopy closure and thus a dispersal habitat function. These underburn units are within the home range of MSNO 2034 and MSNO 2838.

MSNO 2034: The latest data for this site shows a 2004 nesting pair. A 100 acre Late Successional Reserve (LSR) has been established around this site. This site is currently deficient in suitable habitat in both the core area (49 percent) and home range (35 percent). About 24 percent of this site is in non-habitat status. 15 acres of unit 810 and 27 acres unit 820 fall within the home range of this site. Suitable habitat would be reduced to dispersal habitat within the home range. This would reduce the amount of suitable habitat in the home range from 35 percent to 31 percent.

It is the determination of the unit biologist that this is a marginal site at best and by locating suitable habitat downgrading projects in marginal sites, overall adverse effect to northern spotted owls would be minimized. However, the proposed harvest would reduce suitable habitat within the home range by 4 percent and therefore *may affect and is likely to adversely affect* and harm this site due to reduction of already limited suitable habitat.

MSNO 2836: The latest data for this site is a nesting pair in 1999. This pair has an associated established 100-acre Late Successional Reserve (LSR). About 22 percent of this home range in is non-habitat status. Unit 800 (14 acres) and part of unit 810 (15 acres) would underburn suitable habitat and reduce it to dispersal habitat within this home range, reducing suitable habitat within the home range to 39 percent . Since this is below the “harm” threshold, the proposed actions *may affect and are likely to adversely affect* and harm northern spotted owls by reducing suitable habitat in a site which already has limited suitable habitat available in its home range.

Effects of WUI Fuels Treatment to Known NSO Sites

WUI Fuels Treatments occur in the Wildland-Urban Interface (WUI) in order reduce the susceptibility of human built structures to wildfires by creating a defensible space in the WUI. This treatment proposes to reduce the vertical and horizontal continuity of fuels by either chipping or pile burning. This treatment is not expected to change the functionality of the current spotted owl habitat. Since habitat functionality remains the same, this treatment *may affect but is not likely to adversely affect* spotted owls directly nor indirectly.

The following Goose units or portions of: 840, 870, 880, 900, 920, 930, 940, 950, 960, 970, 980, 981, 990 are proposed for Wildland-Urban Interface (WUI) fuels treatments. The WUI fuels project is intended to reduce the vertical and horizontal continuity of fuels to create more defensible space near human built structures. A total of 447 acres of WUI Fuels treatments are proposed within suitable habitat. The removal of small diameter material less than 7” dbh for the chipping or burning is expected to maintain the functionality of the suitable habitat after treatment. In addition, the risk of fire ignition is reduced, and firefighter safety is increased by the creation of a defensible space in the WUI area.

The Goose WUI fuels reduction units are within the home ranges of MSNO 0835, MSNO 0836, MSNO 2417, MSNO 2825, and MSNO 2829.

MSNO 0835: This known site represents a resident single northern spotted owl found in 1990. A 100 acre Late Successional Reserve (LSR) is established around this site. This site is currently deficient in suitable habitat in both the core area (40 percent) and home range (31 percent). About 50 percent of this site is in either private land (16 percent) or in non-habitat status (34 percent). The BioMapper model, used in the ten-year report for the Northwest Forest Plan (Davis and Lint 2005), models suitable habitat on private and non-forest land. It shows about 39 acres of suitable habitat on private land. This increases to total percent of suitable habitat within the home range of this site by only 2 percent (from 31 percent to 33 percent).

Parts of units 880 and 920 would involve a WUI fuels treatment within 28 acres of suitable habitat within the home range. After treatment, this known site would remain below optimal levels of suitable in both its core area and home range. The proposed WUI fuels treatment of 28 acres of suitable habitat *may affect but is not likely to adversely affect* northern spotted owls since habitat functionality would not change after treatment.

MSNO 0836: This site contains a nesting pair and has an established 100 acre Late Successional Reserve LSR. Current suitable habitat acreages are above threshold levels for the core area (51 percent) and the home range area (40 percent). Part of unit 981 and unit 990 would involve a WUI fuels treatment within 46 acres of suitable habitat within the home range. After treatment, this known site would remain above optimal levels of suitable in both its core area and home range. The proposed WUI fuels treatment of 46 acres of suitable habitat *may affect but is not likely to adversely affect* northern spotted owls since habitat functionality would not change after treatment.

MSNO 2417: This site was last located in 2006. A 100-acre LSR was established adjacent to this site. Current acreages for the core (62 percent) and the home range (46 percent) are above threshold levels. Units 930 and part of 940 would involve a WUI fuels treatment within 118 acres of suitable habitat within the home range. After treatment, this known site would remain above optimal levels of suitable in both its core area and home range. The proposed WUI fuels treatment of 118 acres of suitable habitat *may affect but is not likely to adversely affect* northern spotted owls since habitat functionality would not change after treatment.

MSNO 2825: The latest data for this site was a non-nesting pair located in 1991. A 100-acre LSR was established adjacent to this site. About 32 percent of the home range of this site is located in LSR (100-acre LSR 2825 and large LSR RO218). About 28 percent is currently on private land (1 percent) or in non-habitat status (27 percent). Current acreages for the core (62 percent) and the home range (54 percent) are above threshold levels. Units 970 and part of 980 would involve a WUI fuels treatment within 26 acres of suitable habitat within the home range. After treatment, this known site would remain above optimal levels of suitable in both its core area and home range. The proposed WUI fuels treatment of 26 acres of suitable habitat *may affect but is not likely to adversely affect* northern spotted owls since habitat functionality would not change after treatment.

MSNO 2829: The latest data for this site was a pair located in 1991. A 100-acre LSR was established adjacent to this site. Current acreages for the core area (78 percent) and the home range (67 percent) are well above threshold levels. A portion of unit 95 would involve a WUI fuels treatment within 7 acres of suitable habitat within the home range. After treatment, this known site would remain above optimal levels of suitable in both its core area and home range. The proposed WUI fuels treatment of 7 acres of suitable habitat *may affect but is not likely to adversely affect* northern spotted owls since habitat functionality would not change after treatment.

Alternative 3

The effects of Alternative 3 on spotted owl sites are less than those of Alternative 2 (Table 37). Effects to the three individual owl sites that have adverse effects under Alternative 2 are discussed below. Thinning less dispersal habitat with Alternative 3 would continue to provide more dense habitat for flying squirrels. These stands would continue to grow slowly and not show improved structural habitat conditions for many more decades. Snag and large down wood habitat conditions would not be improved.

MSNO 0835: Alternative 3 would not harvest unit 600 (dispersal habitat) within the 0.5 mile core of this owl site. In addition, units 590, 620, 630, and 691 are not harvested within the 1.2 mile home range compared to Alternative 2. All of these units consist of dispersal habitat with the exception of unit 691 which has about 12 acres of suitable owl habitat. Alternative 3 would include the same WUI fuels treatment within 28 acres of suitable habitat within the home range. After treatment, this known site would remain below optimal levels of suitable in both its core area and home range. The proposed WUI fuels treatment of 28 acres of suitable habitat *may affect but is not likely to adversely affect* northern spotted owls since habitat functionality would not change after treatment.

MSNO 2034: The main difference to this owl site between Alternative 2 and Alternative 3 is that it Alternative 3 would not include the 392 acre unit 10 (dispersal habitat) nor the 2-acre new road that would need to be constructed to access this unit. Effects to this owl site would be reduced compared to Alternative 2. In addition, Alternative 3 does not harvest an additional 217 acres of dispersal habitat within the home range of this pair. Alternative 3 would also not include 60 acres of prescribed underburning within the home range of this owl site. The above activities *may affect but are not likely to adversely affect the northern spotted owl.*

MSNO 2836: The main difference to this owl site between Alternative 2 and Alternative 3 is that it Alternative 3 would not include the 200 acres of unit 10 that are within the 1.2 mile home range of this unit, nor would it include the 2-acre new road that would need to be constructed to access unit 10. Effects to this owl site would be reduced compared to Alternative 2. In addition, Alternative 3 does not harvest unit 30 (22 acres of dispersal habitat) within the home range of this pair. Finally, Alternative 3 would not include the underburning of unit 800 which is within the owl site’s 1.2 mile home range. The above activities *may affect but are not likely to adversely affect the northern spotted owl.*

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Appendix G – Response to Comments on the Draft Environmental Impact Statement (DEIS)

Introduction

The McKenzie River Ranger District provided the public with a 45-day comment period for the Goose Project Draft Environmental Impact Statement (DEIS). The comment period began on March 6 2015, and ended on April 20, 2015. Approximately 700 letters were received from members of the public, federal officials, public interest organizations, and private businesses. Of these letters, approximately 550 were form letters; the remaining 150 letters consisted of original responses or form letters with additional original text.

Content Analysis

A standardized content analysis process was conducted to analyze the public letters received on the DEIS. Content analysis is designed to extract comments from each letter received, evaluate similar comments from different letters, and identify topics of concern. Additionally, content analysis ensures that every comment is considered fairly and accurately represents the breadth and depth of the public's viewpoints. All letters and comments have been treated equally. They are not weighted by status of respondents or organizational affiliation and it does not matter if an idea was expressed by hundreds of people or a single person.

During the content analysis process, each letter was assigned a unique tracking number. Content analysts then read letters in their entirety and proceeded to identify discrete comments within them. Each letter may have contained anywhere from one to fifty comments. Each comment was coded based on a particular concern, resource consideration, or proposed management action expressed.

How to Use This Comment Response Document

While all comments were reviewed and considered, only *specific written comments* as defined in 36 CFR 218.2 received a detailed response in the document below. Examples of *specific written comments* include those comments that provided new information; identified a new issue; identified a different way to meet the purpose and need; pointed out a flaw in the analysis; or identified a different source of credible research. General statements of support, opposition, or alternative preferences; comments outside the scope of the project; comments pertaining to issues already decided by law regulation or policy; or comments already addressed in the draft Environmental Impact Statement (DEIS) are not included.

In some cases, comments may have been summarized or paraphrased and similar comments may have been grouped into public concern statements. Pages, chapters, or sections cited within the response to comments refer to the Goose Project Final Environmental Impact Statement (FEIS) unless otherwise noted.

A complete record of all letters, including names and addresses of individuals, agencies, and organizations that submitted a letter during the 45-day comment period, is available online in the Goose EIS Public Reading Room at https://cara.ecosystem-management.org/Public//ReadingRoom?Project=45853 or in the project file located at the McKenzie River Ranger District.

Response to Comments

Comment Number	Comment	Response
Purpose and Need		
1	Request for changes to be made to the final NEPA document: Rewrite the P&N contained in this DEIS to include goals that will improve the amenity resources (i.e. fish/wildlife habitat, soils, recreation, visuals etc.) in the sale area. Provide the public with references and citations from best science literature showing how and why the Proposed Action activities will improve, restore and enhance the health of these amenity resources. These new P&N goals may or may not be achieved by commercial logging.	As stated in Section 1.3, the purpose and need for the Goose project is to provide a sustainable supply of timber products, reduce hazardous fuels, and actively manage stands to improve stand conditions, diversity, density, and structure. While this purpose and need may not explicitly state improvement to amenity resources such as fish, wildlife, soils, recreation, and visuals, the Goose project was designed to benefit these resources whenever possible. Please refer to Chapter 2 (Tables 13-17) and Chapter 3 of the FEIS for information on how amenity resources will be protected and improved with the Goose project.
2	Request for changes to be made to the final NEPA document: Either: 1) remove the following statement from the P&N: "Provide a Sustainable Supply of Timber Products The proposed project is needed to ensure the Willamette National Forest continues to supply a reliable supply of timber products as directed by the laws and guidance discussed in Section 1.3.1 and in doing so contributes to the stability of local, regional, and national economies and achieves the annual Probable Sale Quantity (PSQ) target for the Forest." OR 2) offer the sale as an SBA sale, OR 3) include the following papers (referenced above) in their entirety in an Appendix to the NEPA document. Line-officers must not withhold such important information from the public. Congress promulgated laws to prevent zealous federal officials from behaving in such a manner to feather their nest. "The Economic Impact of Trails-Forest Recreation's Growing Impact" "Seeing Forests for their Green: Economic Benefits of Forest Protection, Recreation, and Restoration", "The Economic Impact of Preserving Washington's Roadless National Forests" "Logging has undercut meaning of 'multiple use' "Seeing Forests for their Green: Economic Benefits of Forest Protection, Recreation, and Restoration" U.S. Undersecretary of Agriculture Jim Lyons' speech to the National Trails Training Partnership "Logging expansion won't help rural communities"	As stated in Section 1.3 of the FEIS, several laws direct and allow the Forest Service to provide the sustainable harvest of trees from the Nation's forests. Additionally, the Willamette National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan, includes goals to produce an optimum and sustainable yield of timber that helps maintain the stability of the local and regional economies. The Goose Project is compatible with multiple use objectives and meets environmental requirements for soil, water, air, and wildlife habitat quality.
3	I notice in the EIS that the only goals mentioned are timber harvest related goals such as timber supply, fuel removal, and "creation of early serial stage habitat". Where are the other goals of "multiple use" management	Many of the goals mentioned by the commenter are those addressed in the Forest Plan and Northwest Forest Plan and are thereby incorporated at the project level. The Goose project has been designed in such a way

Comment Number	Comment	Response
	such as "protection of old growth habitat", "maintenance of late stage serial habitat", "preservation of river corridor integrity", etc.	that it takes into consideration multiple uses, protection of old growth, and preservation of river corridor integrity. For this particular project (and project area), the purpose and need for action is to provide a sustainable supply of timber products, reduce hazardous fuels, and actively manage stands to improve stand conditions, diversity, density, and structure.
Proposed Action		
4	It does not appear that much has changed in the newest proposal and Alternative 2 since the project was stopped two years ago. The Goose project would still log in riparian areas, wilderness areas, and roadless areas. I am disappointed and shocked that you are putting forth this proposal again.	No Inventoried Roadless Areas (IRA) or designated Wilderness are within or adjacent to the Goose project area. In the March 2013 court decision of *Cascadia Wildlands and Oregon Wild vs. USFS,* U.S. Magistrate Judge Ann Aiken concluded that while the Forest Service did adequately disclose environmental information, the potentially significant effect to the environment from the Goose project triggered NEPA requirements that the Forest Service prepare an EIS. Accordingly, the Forest Service was enjoined from going forward with the Goose project until an EIS was prepared. This final Environmental Impact Statement (FEIS) has been prepared to revise the 2010 environmental analysis and decision for the Goose Project Environmental Assessment as directed by a 2013 U.S. District Court order. By preparing this FEIS, the Willamette National Forest is fulfilling agency policy and direction to comply with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. Several changes to the proposed action have occurred since the original 2010 analysis and are documented in Section 1.4.1.
5	Ranger Baker, your Proposed Action does not respond to the Purpose & Need. Therefore, it must be rejected. There is no legitimate science that shows logging and road construction will satisfy your purposes for this sale quoted below. Indeed, logging and road construction will significantly degrade these sale goals: "Increase the Potential for Riparian Reserves to Function as Late Successional Habitat" (page 17) The Goose timber sale will significantly degrade the resources you claim your sale will improve and restore: Indeed, hundreds of scientists quoted in the Opposing View Attachments show your Proposed Action will significantly degrade the resources you claim your sale will improve and restore. The	The opposing views and references provided have been reviewed and no opposing scientific views have been found indicating the proposed action does not respond to the purpose and need for the Goose project. Chapter 3 and Appendix E of the FEIS include extensive analysis and discussion (including references) demonstrating how the proposed action will benefit Riparian Reserves.

Comment Number	Comment	Response
	References section contains no literature indicating logging and road construction will benefit riparian reserves, Request for changes to be made to the final NEPA document: Analyze another alternative in detail that responds to the goal described in the Purpose & Need. The P&N must be modified to do this by eliminating any and all reference to timber harvest.	
6	We recommend withdrawing unit 420 and its sub parcels 422 and 421 from Alternative 2 for the following reasons: • Parcel 422: This parcel has some unique features that make it particularly vulnerable. On its east border, Giustina Resources did a clear cut approximately 13 years ago. Over the years easterly winds have funneled through this area, consistently causing blown down trees. To mitigate the accumulated fuels, the forest service has allowed me permits to remove some of the blown down trees to reduce woody debris on the ground. There are 6 more trees down as recently as February 2015. We predict that the prescribed mechanical treatments and tree removal in this area will make existing trees even more unstable increasing the likelihood of further blow-down and degradation of the health of that area. Further, there are two mature Sugar Pines and at least one seedling needing protection. The Sugar Pines are marked to save but we do not believe the seedlings have been identified . Also, to the south of this unit is a riparian area and we fear that the mechanical applications identified in 422 will degrade the sensitive spring and riparian area that has been set aside for preservation. • Parcels 421 and 420: There are many mature trees in this area creating a canopy approaching old grown characteristics. Few fuels are on the ground. In the natural openings to the forest floor, smaller trees are growing creating a good substructure to replace the older trees as they die. Natural occurring snags and old stumps are creating great habitat for wildlife. Visibility is great on the ground for several hundred yards and moss covers the ground in this nutrient rich environment. Any treatment to this area will detract from its' healthy natural state.	Unit 420 has been dropped from the Goose project.
Public Involvement		
7	Ranger Baker, please post your responses to public comments online as	The FEIS and draft Record of Decision, which includes the Response to

Comment Number	Comment	Response
	well as maintaining a hardcopy in the Project File. Members of the public who submit comments on a draft NEPA document make the effort to read the NEPA document closely and take the time to compose comments that reflect their issues. Ranger Baker, unless you respond to these comments and allow the public to read your responses they don't know if their comments were read and "considered." Also, the USFS is legally required to provide meaningful responses to all "responsible opposing views" submitted by the public. Most opposing views contained in the attachments below would be found in a court of law to be "responsible" because they are authored by Ph.D. scientists who are experts in their fields. Request for changes to be made to the final NEPA document: Post your meaningful, specific responses to the comments contained in this document online. Ranger Baker, if you choose not to allow the public to read your responses to their comments online then consider this a FOIA for your responses. Assure that they are posted within a day or 2 of the date the final EA is released and the objection period begins. Consider this an official FOIA request. Your FOIA person will know what to do.	Comments herein, are available at http://www.fs.usda.gov/project/?project=45853. All comments received on the Goose Project during the 45-day comment period are available in the Public Comment Reading Room at https://cara.ecosystem-management.org/Public//ReadingRoom?Project=45853. FOIA requests must be in writing and submitted to the region that is responsible for the information you are requesting. Details on submitting a FOIA request can be found at http://www.fs.fed.us/im/foia/makearequest.htm
8	Request for changes to be made to the final NEPA document: Include an electronic response to each responsible opposing view contained in the Opposing Views Attachments and post these responses online for the public to examine. The only legal way to avoid responding is to explain why the opposing view is irresponsible.	The opposing views and references provided have been reviewed and no opposing scientific views have been found. The commenter cites some documents that are not peer reviewed scientific studies but are opinion papers or web postings. Scientific papers provided are partially quoted or taken out of context of the study as a whole or misinterpreted. These documents provide no scientific evidence to inform the public further or for respective resource specialists to consider any new or opposing scientific view that would help them reanalyze the Alternatives' effect on resources The documents provided by the commenter are in the project file and can be viewed in the Public Comment Reading Room at https://cara.ecosystem-management.org/Public//ReadingRoom?Project=45853.
9	The vast majority of the input the public has had an opportunity to submit up to this point does not appear in the EIS.	Members of the public, organizations, and state and federal agencies were invited to provide comments and concerns about the Goose project during the public scoping comment period from April 30th through June 16th, 2014. Scoping comments received varied from those that wanted more clarification on proposed activities to specific suggestions for project implementation. Scoping comments were used to help develop planning issues, alternatives, effects analysis, and design features.

Comment Number	Comment	Response
		The McKenzie River Ranger District provided the public with a 45-day comment period for the Goose project Draft Environmental Impact Statement (DEIS). The comment period began on March 6th 2015, and ended on April 20th, 2015. Each comment received was carefully reviewed and considered and many of the suggestions or requests have been incorporated into the FEIS and the draft Record of Decision.
Key Issues		
10	You reject and dispose of some comments submitted by the public by categorizing them as "other issues" and simultaneously violating every public involvement law contained in NEPA and NFMA. Why?	NEPA requires federal agencies to focus analysis and documentation on the key issues related to a proposed action. The Interdisciplinary Team (IDT), with involvement and approval from the Responsible Official, is responsible for determining these key issues and modifying the project design or developing alternatives to respond to these key issues. Other issues are minor issues that do not result in development of alternatives or focus the analysis of environmental effects. In most cases, the IDT is able to address these issues by refining the design of a project (i.e. dropping a unit from the project) or applying a mitigation measure (i.e. requiring buffers around streams). Out of Scope issues are those identified as being "out of scope" of this environmental analysis. These issues include those that are not or cannot be addressed or solved in this project-level analysis; issues already decided by law, regulation, or other higher level decisions; issues irrelevant to the decision being made; and/or issues that are conjectural or not supported by scientific evidence. The description of issues in Chapter 1 has been modified for clarification.
11	Request for changes to be made to the final NEPA document: Assure that all issues identified by the public are listed in the body of the NEPA document posted online. The Responsible Official should discuss each issue and describe how the timber sale will be modified to eliminate any chance that resource harm will occur to the resource at issue. Under no circumstances should any issue declared an "other issue" be hidden away in the Project File at the District.	Please see response to comment 6-2. A complete record of all letters, including names and addresses of individuals, agencies, and organizations that submitted a letter during the public scoping period and 45-day comment period, is available in the project file located at the McKenzie River Ranger District.
Decision Framework		
12	Timber sale contracts agreed to before the new analysis should not influence the Forest Service' decision on how to proceed with this project.	While timber sale contracts agreed to before the new analysis are considered, they do not define or drive the decision. The decision is based on public and agency comments, the effects analysis in the FEIS,

Comment Number	Comment	Response
		supporting reports and documentation, and all applicable laws, regulations, and policies.
Alternatives		
13	The Forest Service should include an alternative that does not include logging this beautiful habitat.	The Goose project analyzed a No-Action alternative (Alternative 1).
Effects Analysis		
14	Ranger Baker, there are 7 quotes from high-level USFS Washington Office employees assuring the public that new projects will be based on "best science." The attachments to these comments include quotes by over 500 Ph.D. scientists (not affiliated with the USDA) who describe how and why logging damages other resources in the forest. Please explain why the statements and expressed need of several USFS timber employees is better science than the experts.	The opposing views and references provided have been reviewed and no opposing scientific views have been found. The commenter cites some documents that are not peer reviewed scientific studies but are opinion papers or web postings. Scientific papers provided are partially quoted or taken out of context of the study as a whole or misinterpreted. Science information improves the ability to estimate consequences and risks of decision alternatives. The effects of each alternative are predicted based on science literature and the professional experience of the IDT specialists. The conclusions of the IDT specialists are based on the best available science and current understanding. Relevant and available scientific information is incorporated by reference and a complete bibliography is included in the FEIS. Referenced material is a consideration of the best available science.
15	Request for changes to be made to the final NEPA document: Include some source documents from the Opposing Views Attachments in the References section. Also, cite the specific quotes presented for the source literature chosen by this member of the public in the text. Finally, include clickable links to each Opposing Views Attachments you choose to include in your reference section. The public deserves to be informed of this information so they can make an informed decision to support or oppose the timber sale based on complete data.	The opposing views and references provided have been reviewed and no opposing scientific views have been found. The commenter cites some documents that are not peer reviewed scientific studies but are opinion papers or web postings. Scientific papers provided are partially quoted or taken out of context of the study as a whole or misinterpreted. These documents provide no scientific evidence to inform the public further or for respective resource specialists to consider any new or opposing scientific view that would help them reanalyze the Alternatives' effect on resources The documents provided by the commenter are in the project file and can be viewed in the Public Comment Reading Room at https://cara.ecosystem-management.org/Public//ReadingRoom?Project=45853.

Comment Number	Comment	Response
Forest and Stand Structure		
16	The DEIS indicates there will be clearcutting associated with the Proposed Action. Of course you hide the fact that you intend to clearcut 43 acres by referring to it only as regeneration. Competent USFS line-officers break this down into clearcut, seedtree and shelterwood. Request for changes to be made to the final NEPA document: * provide data and text demonstrating that soil, slope, or other watershed conditions will not be irreversibly damaged by clearcutting, * include a tradeoff analysis that weighs public acceptance of clearcutting vs. the regeneration success of seed tree and shelterwood prescriptions, * provide data, text and maps demonstrating that protection is provided for streams, stream-banks, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, * provide data and maps demonstrating that cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain, and * provide data and text demonstrating that clearcutting is the optimum silvicultural prescription for the area. * include an explanation describing how and why the Goose clearcuts will be more pleasing to the public than the clearcut photos in Opposing Views Attachment #26	No clearcut treatments are proposed in the Goose project. Please refer to Section 3.1 and Appendix A for a detailed description of proposed treatments. Please refer to Section 3.3 and 3.4 for a detailed discussion on the direct and indirect effects on water, aquatic resources, and soils.
17	"Regeneration" and "variable retention" harvests have nearly the same negative impacts as clearcuts, and we don't need more of these on the landscape.	“Regeneration” is an overarching term which has many factions of which “variable retention” is one. Variable retention is not part of this project. Please refer to section 3.1.4 and Appendix A for a discussion of the direct and indirect effects of Shelterwood with Reserves, the method of regeneration harvest used in this project.
18	Although we would like to see the Willamette National Forest take more substantial steps towards implementing the type of regeneration harvest treatments that their current management plan directs, we do appreciate the McKenzie RD proposing treatments that will yield wood products our members can utilize, as well as treatments that will address the sustainability of the timber resources by implementing a small amount of regeneration harvest. In our opinion, it is impossible to manage timber resources sustainably in the absence of regeneration harvest on the landscape. The Forest Service cannot thin forever. Ultimately the Forest Service will run out of stands to thin, and by that point the forest age-class distribution will be far out of balance to the point where the reliability and sustainability of its timber supplies will be compromised.	As stated in Section 1.3, one purpose and need for the Goose project is to provide a sustainable supply of timber products. To meet this need, the project proposes some Shelterwood with Reserves (Section 3.1.4) to move towards sustainability based on a more balanced harvest consisting of both regeneration harvest and selective harvest (i.e. thinning).

Comment Number	Comment	Response
19	We continuously opposes the use of arbitrary limitations (age, diameter, etc.) on any vegetation management proposal, particularly in the Matrix land allocation. We support treatments that are based upon actual stand characteristics rather than such random values, which we believe to be unsound. The 80-year age limitation used to develop Alternative 3 is flawed in that it assumes that there exists an inherent difference between stands above and below that value. As a forester who visits nearly every federal vegetation management project on the west side of Oregon I have seen 81 year old stands in need of density management treatment, and 79 year old stands not in need of treatment. I'm not entirely sure how this 80-year value became the ultimate base-line for stand evaluation, but I do know, based upon my field experience, that it is of little use toward making sensible vegetation management decisions.	NEPA requires a range of alternatives be analyzed. Alternative 3 was developed in response to issues raised during public scoping (see Section 2.3). Tables 6, 8, and 10 illustrate how the different alternatives meet the purpose and need of the Goose project.
20	The large gap cuts proposed in Alternative 2 could play a small but important role in addressing the issue of sustainable timber supply, which is a serious concern of AFRC. The difficulty that the Forest Service has had implementing any type of regeneration harvest over the past 20 years has resulted in an imbalanced age-class distribution, which is illustrated well on Figures 10 & 11 of the Goose EIS. This imbalance leads to the question of where future timber products off National Forest Land will come from, and also whether the Forest Service is meeting the intent of laws such as the Multiple Use Sustained Yield Act. The 281 acres of gap cuts, and the early seral habitat they could provide, are important to addressing this imbalance. They also address the issue of diversity and structure identified in the purpose & need for this project, especially considering the 464 acres of skips included. So we encourage the McKenzie River District to fully implement these openings by selecting and implementing Alternative 2 rather than incorporating elements of Alternative 3 that would reduce the level of openings in the project area and hamper the level of diversity that could be achieved.	NEPA requires a range of alternatives be analyzed. Alternative 3 was developed in response to issues raised during public scoping (see Section 2.3). Tables 6, 8, and 10 illustrate how the different alternatives meet the purpose and need of the Goose project.
21	I would recommend that no gap or skip harvests be implemented in this alternative. It is my understanding that a skip or gap harvest is where an area is clear cut and areas of forest are left in-between the clear cut areas for regeneration. The cutting of these strips would have a negative impact on the Northern Spotted Owl Species in the area. It would also encourage the growth of invasive species in the area. Also, I can't imagine that in an area under such public scrutiny the use of any clear cut system would be recommended.	No clearcut treatments are proposed in the Goose project. Please refer to Section 3.1 and Appendix A for a detailed description of proposed treatments, including gaps and skips. Please refer to Section 3.5 for a detailed discussion of direct or indirect effects on the Northern Spotted Owl.

Comment Number	Comment	Response
22	I would suggest implementing the gaps surrounding the skips to act as a fire break since the skips would be more prone to large fires because of the buildup of fuels. Making sure to have a separation from old growth dense forest and the urban interface by placing the gaps there would be a good approach.	Placement of gaps would be random unless needed for a specific reason, as identified in Section 3.1.4.
23	I am not opposed to logging. But as I have seen the old growth forest ecosystem dwindle. I do see a need to continue saving well scattered Old Growth Reserves for their special beauty and biodiversity. I would therefore urge you to select Alternative 3 avoiding the true Old Growth Stands for the Goose Timber Sale Project.	Although some mature trees are proposed for logging, no “old growth” stands are proposed in the Goose project. PNW-447 (USDA 1986) provides criteria for defining old growth and has been used for this project. Please refer to section 3.1.3 and Table 18 for additional information.
24	National Forests in Oregon are riddled with hundreds of thousands of acres of second-growth stands, already roaded and logged, waiting for restoration via thinning. The Willamette should devote its apparently available staff to this important task, not cast about in search of the last ancient and roadless forest stands it can locate.	Although some mature trees are proposed for logging, no “old growth” stands are proposed in this project. PNW-447 (USDA 1986) provides criteria for defining old growth which has been used in this project. No Inventoried Roadless Areas (IRAs) or designated Wilderness is within or adjacent to the project area. While thinning is appropriate in many situations, thinning alone will not meet the specific purpose and need of the Goose project (Section 1.3). In order to provide a sustainable supply of timber products and improve stand conditions, diversity, density and structure, a variety of harvest treatments are required. Using a variety of harvest treatments, such as regeneration harvest and selective harvest, moves the project area and Forest as a whole towards more balanced conditions and successional stages, providing benefits to vegetation, wildlife, and overall health of the forest.
25	With such little old growth left, shouldn't the timber production come from only the young dense stands that are in need of ecological restoration? It has been said that the management of mature trees to lessen the density and increase individual tree size but looking at the large trunks and high canopy already established the forest seems to be doing just fine.	Although some mature trees are proposed for logging, no “old growth” stands are proposed in this project. PNW-447 (USDA 1986) provides criteria for defining old growth which has been used in this project. While thinning is appropriate in many situations, thinning alone will not meet the specific purpose and need of the Goose project (Section 1.3). In order to provide a sustainable supply of timber products and improve stand conditions, diversity, density and structure, a variety of harvest treatments are required. Using a variety of harvest treatments, such as regeneration harvest and selective harvest, moves the project area and Forest as a whole towards more balanced conditions and successional stages, providing benefits to vegetation, wildlife, and overall health of the forest.

Comment Number	Comment	Response
26	I lived on King Road in Bob Drury's old house after my step mom inherited it. Are you going after that old growth? Seriously, to me the worst thing you could do is log old growth anywhere in the public's eye. It just seems like you have taken a personal stance on getting the lower land old growth cut and sold. I don't have a lot of problems with logging second growth but I think that the logging of old growth should stop. I mean you have the roads for the second growth already established. The mills are retooled for second growth. It's more of an ego thing nowadays for cutting and hauling one log loads. I used to walk by the scaling shack while tons of old growth zipped in and out of there. Then Melva took it home for a pigpen. Please stop logging the old growth, the riparian sections by the rivers and streams, and do your part to ensure clean excellent cascade aquifer water for generations to come.	Although some mature trees are proposed for logging, no "old growth" stands are proposed in the Goose project. PNW-447 (USDA 1986) provides criteria for defining old growth and has been used for this project. Please refer to section 3.1.3 and Table 18 for additional information.
27	One of the main reasons presented for this project is the reduction of hazardous fuels that would increase the intensity and duration of any wildfire occurrence. This produces the question of, why are there hundreds of acres of older forest cutting proposed when the great majority of their fuel remains suspended high above ground?	Although some mature trees are proposed for logging, no "old growth" trees are proposed in this project. PNW-447 (USDA 1986) provides criteria for defining old growth which has been used in this project. Stands proposed for hazardous fuels treatments are in the Wildland-Urban Interface (WUI). Reducing hazardous fuels in these stands has the potential to reduce or alter wildfire behavior through a decrease in surface fuel loading and reduction of ladder fuels.
28	Appropriate harvesting systems can also be used to achieve an economically viable sale and increase the revenues to the government. We would like to see flexibility in the EIS and contract to allow a variety of equipment access to the sale areas. We feel that there are several ways to properly harvest any piece of ground, and certain restrictive language can limit some potential bidders, thus driving the bid value down. We encourage the Forest Service to conduct an economic analysis early in their planning process to explore the viability of each stand treatment. Including language in the EIS and contract that specifies damage tolerance levels rather than firm restrictions gives the operator flexibility to utilize their equipment to its maximum efficiencies.	The McKenzie River Ranger District aims for flexibility while analyzing the effects of the most impactful harvest system on a unit (i.e. analyze for ground based fellerbunchers on both yard and helicopter units if conditions are favorable). Design features have been included in the project design to allow for flexibility by setting upper thresholds of acceptability based on slopes and access. Please refer to Chapter 2, Table 13, Design Feature 17 for additional information.
Fire and Fuels		
29	Request for changes to be made to the final NEPA document: Please do the following to save homes and maybe human lives: 1) send letters to those who live in the WUI offering USFS help to remove fine fuels within 100 yards of their property providing they provide written permission. 2)	The Willamette National Forest partners and collaborates with the Oregon Department of Forestry (ODF) who carries out the objectives of the Lane County Community Wildfire Protection Plan (CWPP). The majority of home owners in the project Wildland-Urban Interface (WUI) are familiar

Comment Number	Comment	Response
	distribute handouts and flyers to the people living in the WUI that summarize Dr. Cohen's research findings including his discovery that fine fuels removal near homes is much more effective than hazardous fuels removal at reducing wildfire damage to homes. 3) announce a workshop/training session to study and become familiar with Dr. Cohen's work and conclusions. To reach as many local residents as possible the final EIS should clearly indicate the USFS will accomplish #1 to #3 above and include the timeframes.	with and support Firewise and WUI projects that have occurred over the last 10 years. ODF has provided private land owners with pamphlets and community meetings (which we have attended) to educate them about fire and emphasize the importance of fuels reduction on their property. The Forest Service is responsible for reducing hazardous fuels on public land along private property boundaries and in the WUI.
30	My concern is with the burning of biofuels rather than chipping them on site, collecting them for biofuel use, chipping them to be sold, or some other intelligent use of recycling rather than adding to the particulate matter in the atmosphere.	Chipping is often used on projects or in areas where a truck towing a chipper can access the units or fuels that are pulled to a point of access for the chipper. If areas are inaccessible with the chipper, we pile and burn the fuels. Pile and burn is done when the fuels are dry which creates lower emissions than if they are wet. Biomass has been considered but as of right now the expense of collecting fuels (and maintaining the supply) creates difficulties for biomass to be an economically feasible choice.
31	I believe the Forest Service can meet the need for the projects urban fire management without logging in old-growth forests. Timber harvest as proposed in Alternative 3 would address the need to timber production. Moreover, the USFS could partner and support the Lane County Firewise Incentive Program http://www.lanecounty.org/Departments/PW/LMD/Firewise/Pages/default.aspx to address the concern about fire.	Although some mature trees are proposed for logging, no “old growth” stands are proposed in the Goose project. PNW-447 (USDA 1986) provides criteria for defining old growth and has been used for this project. Please refer to section 3.1.3 and Table 18 for additional information. The Willamette National Forest partners and collaborates with the Oregon Department of Forestry (ODF) who carries out the objectives of the Lane County Community Wildfire Protection Plan (CWPP). The majority of home owners in the project Wildland-Urban Interface (WUI) are familiar with and support Firewise and WUI projects that have occurred over the last 10 years.
32	I would recommend that pile and burn procedure not be implemented. It is my understanding that under the current alternative three, 309 acres of land are going to receive this treatment. The piling and burning of CWD not only has a negative impact on soil microbes in the area, but also releases large amounts of carbon into the air. It is unclear in the plan how the Forest Service will implement this strategy.	All harvest units will have some form of post-harvest slash (fuels) treatments. The hand or mechanical treatments scheduled could change to underburns due to diameter of trees and location and timing of the sale. Some of the mechanical treatments could include mastication or chipping which would reduce the amount of fuel burned post-harvest. In all the units where post fuels treatments take place, Forest Plan standards and guidelines (FW-212 and 252) would be met. Pile burning harvest slash at the landings does create soil impacts but these are in areas along the road or in the landings which have already been impacted by operations. Piles that are built well and stay dry

Comment Number	Comment	Response
		through the winter (covered) will burn more quickly and thoroughly, reducing the amount of particulate matter emitted. If slash is left within the units and a wildfire occurs, the particulate matter emitted would be greater due to the risk of wildfire spreading throughout the entire unit and into adjacent areas. With the potential for higher severity and intensity fires, and an increase in crown fire, firefighters cannot safely suppress the wildfire thus leading to a higher probability of the wildfire increasing in size and creating greater risks to people, the community and natural resources.
Soils		
33	The EIS specifically cites other established logging roads that run through this area as major sources of soil compaction. It is especially concerning that the accumulative effects of this compaction are reported to be above ecosystem thresholds in some areas.	Past monitoring of post-harvest subsoiling has shown that compaction can be reduced 4-10 percent of the initial levels. As mitigation in Units 100 and 410, all landings, temporary haul or primary skid roads utilized by the purchaser/logger would be subsoiled to a depth of 18 to 24 inches at the completion of logging activities. Additional enhancement subsoiling is required for heavily compacted areas not utilized by the Purchaser in these units. Subsoiling of landings and primary haul or skid roads is required in all ground based units to ensure that cumulative levels remain well below the 20 percent standard outlined in the Forest Plan. Some post-sale enhancement subsoiling is recommended for areas not utilized by the Purchaser in units approaching Standard and Guideline compaction levels. Mitigation as described above would result in reduced compaction levels; as such, the end result of the Goose project is that no compaction standards will be violated. Please refer to Chapter 2, Table 13, Design Feature 22 and 23 and Section 3.3.4 for additional information.
34	The DEIS concedes that soil compaction standards will be violated through the implementation of Alternative 2. Speculative mitigation from sub-soiling efforts is not sufficient. If soil compaction standards will be violated, the responsible logging and road construction units that impact these degraded areas must be dropped from the project.	Monitoring of post-harvest subsoiling has shown that compaction can be reduced 4-10 percent of the initial levels. As mitigation in Units 100 and 410, all primary landings, temporary haul or principal skid roads utilized by the purchaser/logger would be subsoiled to a depth of 18 to 24 inches at the completion of logging activities. Additional enhancement subsoiling is required for heavily compacted areas not utilized by the Purchaser in these units. Subsoiling of landings and primary haul or skid roads is required in all ground based units to ensure that cumulative levels remain well below the 20 percent standard outlined in the Forest Plan. Some post-sale enhancement subsoiling is recommended for areas not utilized by the Purchaser in units approaching Standard and Guideline compaction levels. Mitigation as described above would result in reduced compaction levels; as such, the end result of the Goose project is that no compaction

Comment Number	Comment	Response
		standards will be violated. Please refer to Chapter 2, Table 13, Design Feature 22 and 23 and Section 3.3.4 for additional information.
Water Quality and Aquatic Resources		
35	Section 10 covers a large number of acres and this may lead to lots of water in the headwaters of these streams to pick up lots of sediment and increase the stream flow. With respect to storm water runoff and erosion of sediments and sedimentation I would suggest only treating some of the riparian areas and not all of them in section 10.	A variety of no-treatment buffers are prescribed for Unit 10 in order to avoid sediment delivery into streams and potential increased stream flow. Please see Section 2.4, Table 11 for more information.
36	We sit to the south side of lookout mountain. The riparian areas extend along the base of the mountain. This is a clean, fresh water spring fed hillside that the Goose project transects. Any major disturbance on any Industrial scale will have increasing negative consequences as Alternative would have on our community. As a 40 year resident who explored the 1976-77 flooding my neighbors and I following the water flow as it came off the mountain. We followed the main flooding up the hillside where a power line road and a clear cut above it were both contributing to the flooding below. While the clear cutting above increased the runoff, it was the power line road which allowed Glen creek (just to the east) to dispersed and emptying into Goose creek drainage thus flooding everyone below. This problem was verified at the Glen creek culvert on North Bank Road when it was 1/2 full going in (and a direct shot to the river)while all of Taylor flat (Goose creek) was virtually under water. I've tried a number of times to get this addressed and have never been successful. If Alternative 2 is selected our hydrological problems will become much worse, we can count on it.	Analysis conducted for the Goose project indicated that thinning of stands would not increase peak flows. Additionally, the portion of the power line road discussed in the comment will be significantly upgraded, particularly at the stream crossings. These upgrades will improve flood water passage in order to avoid future alteration of stream channels. Please refer to Chapter 2, Table 13, Design Feature 75 for additional information.
37	The analysis of not logging riparian reserves says "Accelerated restoration of riparian stands that currently do not meet ACS Objectives would not be accomplished." This is incomplete and misleading. The NWFP says that logging is prohibited unless "needed." Here logging is designed to accelerate changes that are already happening naturally. This logging will have adverse effects that are avoided by relying on natural processes. See Lutz. J.A. 2005. The Contribution of Mortality to Early Coniferous Forest Development. MS Thesis. University of Washington. http://faculty.washington.edu/chalpern/Lutz_2005.pdf. This mischaracterization of the baseline condition is a violation of NEPA. Please revisit this analysis in the FEIS.	It is clearly stated in Section 3.5.5 that desired conditions could eventually be achieved by allowing natural processes to occur, but that it would occur over a longer timeframe relative to active restoration: *"Desired riparian conditions – high species and structural diversity with large dead and down wood – would slowly develop over time (several decades) and depend solely on natural thinning events (stem exclusion mortality and disturbance). Without management to increase the abundance of deciduous and herbaceous vegetation in dense, conifer-dominant stands, ecosystem productivity would remain at relatively lower levels. Accelerated restoration of riparian stands that currently do not meet ACS Objectives would not be accomplished."*

Comment Number	Comment	Response
		Watershed Restoration is one of the four components of the ACS. The strategy states that *"active silvicultural programs will be necessary to restore large conifers in Riparian Reserves. Appropriate practices may include…thinning densely-stocked young stands to encourage development of large conifers..."* (ACS B-121). The strategy further states that *"the most important components of a watershed restoration program are control and prevention of road-related runoff and sediment production, restoration of the conditions of riparian vegetation, and restoration of in-stream habitat complexity".* Thinning is described as one tool for achieving restoration goals so that ACS objectives can be met. Both active and passive restoration are prescribed in this project area. See Appendix E for further details about how these activities will meet ACS Objectives.
38	DEIS (p 95) says about the no action alternative "the currently dense riparian stands would be at greater risk to high severity fire, insect infestation, and disease - all carried more efficiently through overstocked stands." This is a flawed and incomplete statement. The FS has not taken a hard look that would reveal, that fire, insects and disease are all essential processes that create and maintain healthy forests. These processes are NOT problems, but rather solutions to the alleged dense conditions within stands. The FS also failed to recognize that forests within riparian reserves are generally less prone to "high severity" effects from fire and insects, because the conditions on lower slopes tend to be relatively cool and moist and less windy which tends to moderate fire effects. Also, trees living on lower slopes near streams tend to be less water stressed and better able to defend themselves from insects.	Clarification of this statement and associated references have been added to Section 3.4.5.
39	DEIS (P 100) says that logging will occur in 9 acres of riparian reserves over 80 years old. "Thinning within Riparian Reserves of stands over 80 would occur in only three units in Alternative 2 (Units 130, 210, 380; all under 100 years old; approximately nine acres total). These stands have structure and species composition very similar to younger (60-80 year old) plantations. Both units 130 and 380 are fire-regenerated stands but show signs of having been historically salvage logged with other human-caused impacts which likely influenced the current stand condition." We strongly object to logging riparian reserve stands over 80 years old. There is just no need. The superficial resemblance to younger stands is not a reason to log these older stands. At this age, stand growth has slowed and they need to hold onto their biomass and let it begin accumulating in live and dead pools. Logging will export valuable habitat structure and it will	Careful thought and analysis was used when developing Riparian Reserve management strategies. We looked at stand conditions for each waterbody and made recommendations based on several factors, not just age. Studies and forest stand classifications have shown that the maximum mean annual increment (an indication of tree growth) is achieved much later than 80 years in these types of stands (and soil type) (see Section 3.1). This suggests that in some stands, 80 years is an arbitrary delineation, and that there is significant stand and structural resemblance to younger stands. Riparian Reserve prescriptions were developed on a unit by unit basis to meet the distinct needs of the stream habitat and surrounding vegetation. As discussed in Section 3.4.5, we acknowledge that *"based on a review of*

Comment Number	Comment	Response
	increase stand vigor and delay recruitment of dead wood which is critical both instream as well as upland portions of riparian reserves. Natural processes are operating to develop high quality habitat without the need for intervention. Once stands reach 80 years old the FS need to put much more focus on the first three words of the NWFP standards for riparian reserves "TM-1. Prohibit timber harvest," (NWFP ROD p C-31)	*existing literature and stand development theory, Spies et al. (2013) found that the 'greatest potential ecological benefits of thinning to accelerate the development of older forest structure (e.g. large trees, large dead trees, spatial structure and compositional heterogeneity, etc.) come in dense uniform plantations less than 80 years and especially less than 50 years old.' The benefits of thinning in stands over 80 years old are more variable."* We then explain that *"stand conditions were reviewed for each waterbody and recommendations were based on multiple variables, not just age. These factors included tree height and diameter, stand density, species composition, and understory development. In both action alternatives most stands where thinning would occur within Riparian Reserves are under 80 years old. Thinning within Riparian Reserves of stands over 80 would occur in only three units in Alternative 2 (Units 130, 210, 380; all under 100 years old; approximately nine acres total) and only one unit in Alternative 3 (Unit 210; 93 years old; approximately four acres total). These stands have structure and species composition very similar to younger (60-80 year old) plantations."* Stand data is then described for two of the units, Units 130 and 380, as part of fire regenerated stands: "*Similar to young managed stands in the project area, these fire regenerated stands are in the stem exclusion stage, where small amounts of understory development is apparent and there is very little species diversity. Average trees per acre in these stands is 193, higher than the average 172 trees per acre found in managed stands. The average Stand Density Index is 417, higher than 334 found in managed stands. Because these fire regenerated stands are more heavily stocked than managed stands and the existing lack of complexity and diversity may be limiting nutrient cycling, deciduous organic matter input to waterbodies, and habitat for riparian-dependent wildlife, treatments were proposed."*
40	DEIS (p 100) discussion of the action alternatives says "Protecting at least 90 percent of potential wood inputs would maintain ACS Objectives related to instream wood while allowing for treatments to improve vegetation and accelerate the growth of future instream wood." There are several problems with this. First, it allows a 10% reduction in instream wood recruitment which violates the "do not retard" standard of the Aquatic Conservation Strategy. Second, it emphasizes wood recruitment	In regard to the first and second concern, we acknowledge in Section 3.4.5 that *"in some cases, maintaining and/or restoring each one of the ACS Objectives can be a balancing act with trade-offs. For example, to meet the riparian vegetation objectives ("species composition and structural diversity of plant communities" and "habitat to support well distributed populations of native plant, invertebrate and vertebrate riparian dependent species") in young, dense conifer stands, a common*

Comment Number	Comment	Response
	instream while ignoring the equally important need for wood recruitment in the upland portion of the riparian reserves. Third, it perpetuates the myth that thinning enhances future wood recruitment, when in reality any increase in very large wood in the distant future comes that the expense of significant reduction in wood recruitment in functional sizes classes. The FS failed to take a hard look at this.	*silvicultural tool is to remove overstory density to encourage understory growth and structural development. Removal of overstory density, however, could potentially lead to increased thermal loading or reduction of wood volume available for recruitment. Because of these trade-offs, conflicting objectives were carefully balanced based on characteristics of each waterbody and adjacent riparian area."* We then explain on page 102 that "*protecting at least 90 percent of potential wood inputs would maintain ACS Objectives related to in-stream wood while allowing for treatments to improve vegetation and accelerate the growth of future in-stream wood. For the portions of Riparian Reserves where thinning is proposed, the primary and secondary shade zones on all perennial streams (Class 1, 2, and 3) and wetlands as well as the primary wood recruitment zones would be maintained in a state that provides adequate protection. On most intermittent streams (Class 4) and wetlands, the wood recruitment zones would be protected, and where treatment is recommended inside those zones, dead and down wood objectives would be met through special treatments. Across the project area, current levels of down wood are within estimated historical ranges (see Wildlife Section for more information). However within specific treatment units where current estimates are well below historic ranges, down wood creation is proposed so that habitat needs are met at a site specific as well as a landscape level."* In regard to the third concern, a hard look was taken and is discussed on page 96: *"Current rates of large wood recruitment, provided mostly by stem mortality (from competition, disease, wind and snow downed trees) and bank erosion, would be maintained. Alternative 1 would provide a slightly higher rate of in-stream wood recruitment compared to the action alternatives. Where the action alternatives protect about 90 percent of the wood recruitment zones, the No-Action alternative would protect 100 percent. In some streams, recruitment trees are of sufficient size to meet ACS Objectives, but in other streams with small diameter riparian stands the aquatic benefit is limited, namely through the reduced ability to store sediment and organic matter and contribute to habitat forming processes (e.g. scour). Though small wood has some value, particularly in the smaller headwater reaches, the longevity of recruited small diameter trees is short-lived, as they break down through abrasion and decomposition more rapidly compared to large trees. Small diameter trees are also more likely to be transported out of the system. In-stream wood abundance is*

Comment Number	Comment	Response
		low for most streams in the project area and is largely due to the lack of large enough wood to remain stable in channels." Additionally, as discussed on page 91, "*many of these stands were set on a management-induced trajectory that has led to artificially dense, conifer-dominant stands, with tree densities above the natural range of variability expected in this area. Recent forest research in the Coast Range and Western Cascades indicates that existing old growth stands developed with natural stand densities of 40 to 60 conifers per acre (Tappeiner et al. 1997; Poage and Tappeiner 2002). Stand densities in the project area range from 79 to 362, with an average of 189."* Therefore, down wood resulting from continued stand development is expected to be considerably higher in these stands than typically found in naturally regenerated stands.
41	DEIS (P 100) says "dead and down wood objectives would be met" What objectives? No objectives are specified or quantified. From an ecological perspective there is no such thing as too much wood. Current standards for snags and dead wood are outdated. More dead wood is needed to meet a wider variety of life needs and more green trees are needed over time to recruit that dead wood. The FS can't continue to manage against dead wood while its standards are known to be inadequate.	Clarification/quantification of these objectives can be found in Section 2.4.1, 3.4.4, 3.4.5, and 3.5.13. Prescriptions for snags and down wood were developed based on modeling using the Forest Vegetation Simulator (FVS). These prescriptions are summarized in Chapter 2, in Tables 11, 12, 14, and 15.
42	The agency often claims that logging in riparian reserves is necessary to improve attributes other than large wood. However, these benefits are often minor and transitory, and do not outweigh the significant long-term adverse effect of logging on recruitment of dead wood. The agency must focus on the most significant contributions of vegetation toward ACS objectives and the most significant effects of logging on the ACS objectives. If the agency intends to log in riparian reserves to increase some nebulous goal like "vegetation diversity and complexity," then please explain why the biophysical indicators for the ACS objectives do not include any mention of vegetation diversity or complexity.	The ACS Objectives look at a wide variety of important attributes in Riparian Reserves. All aspects were developed to be considered and balanced. ACS Objective #8 specifically mentions the importance of species and structural diversity of plant communities : *"Maintain and restore the species compositions and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distribution of coarse woody debris sufficient to sustain physical complexity and stability."* It is important to note that all nine Objectives list equally valuable attributes found in healthy, functioning Riparian Reserves. How this project's various alternatives will affect all attributes described in the ACS Objectives can be found in Appendix E.
43	I would like to see that no riparian areas be harvested. While your plan sates that the TMDL in waterways will not exceed the limit, any harvest in this area will affect the water quality of the waterways. The economic gains of harvest in this area can't outweigh the potential problems of	Treatment prescriptions and buffers in Riparian Reserves were developed in order to avoid detrimental impacts to water quality by way of temperature, nutrient availability, light availability, flow alterations, etc. Please refer to Section 3.4 for detailed information on protecting water

Comment Number	Comment	Response
	harvesting in the riparian zones. A buffer area should be implemented where no harvest occurs.	quality.
Wildlife		
44	The Forest Service needs to begin analyzing the impacts of timber harvest and associated road construction on wolves and other returning predator species including wolverines at higher elevations. While habitat limitations generally do not exist for wolves because they are habitat generalists, the Final EIS should address potential impacts to these species associated with road constructions and densities. Although wolves are not officially verified on the Willamette, they are heading this direction, and the Forest needs to begin modeling and anticipating effects on the species. We have seen from other National Forests that deal with wolves that increasing road densities in an area leads to increasing hunting/poaching opportunities for wolves and other predators.	No new permanent roads are proposed in the Goose project; therefore, road densities will not increase. There is currently no resident wolf population on the Willamette National Forest, and thus they are not on our current Region 6 Strategic Species List. If a resident wolf population does establish itself in the future and the U.S. Fish and Wildlife Service (USFWS) lists wolves as present in counties overlapping with the Willamette National Forest, we will include them in our consultation and biological assessment on future projects and work with other agencies to recover the population. While it is possible that a wolverine may travel through the Willamette National Forest, no one has been able to document a wolverine from a photograph or DNA. Two years of carnivore surveys conducted in suitable wolverine habitat in 2013 and 2014 did not detect any wolverines. Additionally, the Goose project area does not provide the higher elevation, more secluded habitat that wolverines require. The Montane Red Fox has not yet been officially listed and is not on the current Region 6 Strategic Species List. The Montane Red Fox is known to occur above 4000' feet elevation near the Cascade crest, and thus does not inhabit the Goose project area. Fishers are discussed in Sections 3.5.9 and 3.5.10.
45	The DEIS fails to take a hard look at the effects of logging suitable owl habitat. In particular, DEIS (p 125) fails to fully and accurately disclose the effects of 373 acres of commercial harvest in suitable owl habitat. The invasion of the barred owl changes the assumptions that underlie the allowance of logging in the matrix land allocation in the Northwest Forest Plan. The 1994 analysis assumed that all suitable habitat would be available to spotted owls, but now much of the available habitat is occupied and defended by barred owls. When territorial competing species are involved it is axiomatic that more habitat will increase the chances of co-existence, while less habitat will increase the changes of adverse competitive interactions. The FS can no longer tier to the cumulative effects analysis in the 1994 FSEIS to support logging suitable habitat.	The 373 acres referred to by the commenter are stands between the ages of 81-127 determined not to meet the stand quality of suitable owl habitat, and were classified as dispersal habitat. Several errors were found in Table 31 and have been corrected in the FEIS. Please refer to Section 3.5.7 where suitable, dispersal, and non-habitat for spotted owls is described in detail. The U.S. Fish and Wildlife Service discusses the significant amount of uncertainty regarding the effects of forest management on habitat competition between the owls, ultimately concluding that "the Northwest Forest Plan in concert with the guidelines from the Northern Spotted Owl Recovery Plan still provides the backbone for the federal contribution to spotted owl recovery even with the uncertainty surrounding the effect of

Comment Number	Comment	Response
		the barred owls on spotted owls." (2009 Biological Opinion – FWS reference 13420-2010-F-001) The FEIS includes discussion of barred owls and interspecific competition between barred owls and spotted owls in Section 3.5.7 and 3.5.8.
46	The invasion of the barred owl represents new information that has not received plan level NEPA analysis. USFS cannot rely on FWS recommendation to conserve just a subset of high quality nesting, roosting, foraging habitat, because the recovery plan never went through NEPA. In essence, the FS is using Recovery Action 32 as a de facto plan amendment to justify logging in suitable habitat that is not yet "high quality." The FS cannot adopt a plan amendment without following NFMA and NEPA procedures. When the agency discovers that its plans are out of date and adopts new strategies, the agency must follow NEPA and NFMA procedures to amend its forest plan.	The Goose EIS has followed all applicable legal requirements, including NFMA, NEPA, and ESA (Appendix C - Compliance with Laws, Regulations and Executive Orders). Plan level NEPA analysis regarding the invasion of the barred owl is outside the scope of this project. The 2011 Recovery Plan and 2012 Critical Habitat Rule encourage land managers to maintain and restore owl habitat. Approximately two acres of RA32 habitat would be removed for temporary road construction to access Unit 10. Unit 10 is a 392-acre stand of dispersal habitat that is in poor timber health, growing slowly, and highly susceptible to disease, insect outbreaks and fire. The treatments proposed in Unit 10 are expected to promote multiple canopies, faster tree growth, greater stand complexity, and reduce threats from insects, disease, and fire. The USFWS concluded that treatment planned in Unit 10 would benefit future owl critical habitat. The removal of two acres of RA32 habitat is consistent with the 2011 Recovery Plan and the 2012 Critical Habitat rule and was evaluated in the USFWS Biological Assessment.
47	The forest service states part of the initiative is to "actively manage stands to improve stand conditions, diversity, density and structure." I find one problem with this statement, the northern spotted owl, an endangered species, is in greatest abundance within the old growth forests of this area in the northwest. Alternatives 2 and 3 call for the removal of large areas of timber and they will not discriminate in favor of the Northern Spotted Owl. With a combined 1,700 pairs of Northern Spotted Owl in Oregon and Washington, the removal of old growth forests will surely decimate this already small population because it is the same reason (habitat removal) that they are in this position in the first place.	With the federally threatened status of the Northern Spotted Owl, wildlife biologists and others who work for the U.S. Forest Service spend a considerable amount of time working in support of its' recovery. A thorough analysis of the effects of this project to the spotted owl has been conducted, including a Biological Assessment (USDA Forest Service 2012) that was sent to the U. S. Fish and Wildlife Service for ESA consultation, and the resulting Biological Opinion (U.S. Fish and Wildlife Service 2013), which has been documented in the Goose EIS. All applicable laws and standards are being followed, including those in the 2011 Northern Spotted Owl Recovery Plan. While the proposed project would remove suitable and dispersal habitat for the Northern Spotted Owl, the project was designed to avoid significant effects: no habitat removal within 300m nest patches, thinning of dispersal habitat which may allow these stands to better develop future habitat structures, and only about 25 acres of habitat removal within known 0.5 mile nest cores (Table 33).
48	According to the Western Environmental Law Center, there are 454	While 454 acres of suitable owl habit occurs in the Goose project area,

Comment Number	Comment	Response
	acres of suitable spotted owl habitat within the proposed project area. Though this number may seem small compared to the size of the forest, spotted owl habitat is already highly fragmented. Destruction of this habitat will result in heightened competition between the spotted owl and the invasive, more aggressive barred owl.	only 43 acres (less than one percent of suitable owl habitat in the project area) would be removed. A thorough analysis of the effects to the spotted owl has been conducted and is documented in Section 3.5.7 and 3.5.8 of the FEIS.
49	The EIS identifies that the project would also reduce red tree vole habitat; we consider the difference between acres of habitat disturbed to be significant (~424 acres in alternative 2 vs. ~ 14 acres in alternative 3.)	The Goose project follows all applicable rules and regulations for the Northwest Forest Plan concerning protection and management of red tree voles. Red tree vole protocol surveys were conducted in the Goose project area as required in 2010 and again in 2015. No active red tree vole nests were found.
50	It appears from the DEIS that some of the red tree vole surveys being relied upon by the agency are from 2009. Red tree vole surveys are only valid for 5 years. These surveys need to be conducted again, and are especially important given that in this region, voles are considered extremely rare.	The Goose project follows all applicable rules and regulations for the Northwest Forest Plan concerning protection and management of red tree voles. Red tree vole protocol surveys were conducted in the Goose project area as required in 2010 and again in 2015. No active red tree vole nests were found.
51	I do not agree with your plan to take huge old trees to make gaps for elk grazing. I do not think the elk appreciate you using them as an excuse to remove old growth forest. I imagine there are other lands with younger trees that would be suitable. I imagine the elk are wondering what the setup is anyway. BLAME them for cutting old growth then hunt them to death. The elk do not need your kind of help.	Although some mature trees are proposed for logging, no "old growth" stands are proposed in the Goose project. PNW-447 (USDA 1986) provides criteria for defining old growth and has been used for this project. Elk and deer are important big game hunting species in Oregon. The project area is in the state-designated McKenzie Wildlife Management Unit (WMU). Since the publication of the Willamette Forest Plan in 1990, deer numbers and hunter success have fallen by more than 50 percent and elk numbers have declined substantially below Oregon Wildlife Population Management Objectives (Forest Service 2011) in the WMU. Reduced forage quality and quantity due to the reduction in clearcut logging on the National Forest are important factors in this decline. There is a public demand for elk hunting in Oregon and the Forest Service regularly receives public comments about the lack of elk forage. While forage levels are not likely to increase to historic levels due to a wide variety of other issues, management plans that guide actions on the Willamette National Forest support a certain level of diverse early seral habitat.
52	There may be an increased risk of extinction if certain precautions are not taken into consideration. According to the Endangered Species Act (ESA), the intent is to "halt and reverse the trend toward species extinction, whatever the cost." By removing habitat that is home to species that are endangered or threatened is against laws of the United States	With the federally threatened status of the Northern Spotted Owl, wildlife biologists and others who work for the U.S. Forest Service spend a considerable amount of time working in support of its' recovery. A thorough analysis of the effects of this project to the spotted owl has been conducted, including a Biological Assessment (USDA Forest Service 2012) that was sent to the U. S. Fish and Wildlife Service for consultation,

Comment Number	Comment	Response
		and the resulting Biological Opinion (U.S. Fish and Wildlife Service 2013), which has been documented in the Goose EIS. All applicable laws and standards are being followed, including those in the 2011 Northern Spotted Owl Recovery Plan.
53	Owl populations are declining rapidly, and speculative approaches to enhancing habitat in the distant future through commercial logging are hastening their demise, especially when that involves downgrading viable habitat that's already in short supply. For instance, a statement is made in the EIS that removing dispersal habitat is acceptable, because "sufficient habitat would remain in the area to facilitate owl dispersal". This kind of rationalization is highly speculative, unproven, and is what led to a precipitous decline in owl populations in the first place.	The effects of the Goose project on owl populations were analyzed in detail in Section 3.5.7 and Appendix F. The statement that "sufficient habitat would remain to facilitate owl dispersal" is based on the knowledge that spotted owls have been documented to successfully disperse across a variety of different landscapes, including across openings. Wildlife biologists review the current and future landscape for each alternative and determine if dispersal habitat would be adequately connected. This was found to be the case for each of the thirteen spotted owl activity centers in the Goose project area. Commercial thinning will not impair the functionality of any owl home ranges as stated in the discussion in the Biological Opinion, 6.1.3 Harvest Habitat Maintain - Dispersal and Non-habitat, pp. 42-43 (U.S. Fish & Wildlife Service 2012). The removal of two acres of suitable habitat in Critical Habitat (CH), the maintenance of 22.5 acres of suitable habitat and 506 acres of dispersal habitat will not impact the ability of spotted owls to move across the landscape, though the degradation of dispersal habitat within 54 acres of dispersal habitat may reduce prey base and delay development of late and old structure in localized areas (U.S. Fish & Wildlife Service 2012, p.45). While some small adverse effects will occur at the stand scale from the degradation of dispersal habitat, these effects are considered insignificant at the subunit and unit scales (U.S. Fish & Wildlife Service 2012, p.45).
54	Thinning prescriptions are far too severe. Reducing canopy cover to 20% within harvest units renders habitat inhospitable to many forest dependent species, specifically Northern Spotted Owls and two of their primary prey species, flying squirrels and red tree voles. A recent study by Todd Wilson demonstrates that thinning negatively affects flying squirrel populations in proportion to the severity of the prescription. Red tree voles prefer closed canopy conditions for survival and dispersal. The ESA mandates that agencies manage forests for the recovery of the Northern Spotted Owl. A serious effort to recover owl populations would require maintaining suitable habitat for their prey base in an area greater than the current home range of each nesting site, to allow for dispersal.	Effects of the Goose project on the northern spotted owl are discussed in detail in Section 3.5.7 and 3.5.8. The Forest Service is required to balance the needs of the northern spotted owl with a host of other species that have conflicting habitat requirements. A wildlife biologist participates in the planning of each project and provides input that follows current rules, regulations, guidelines, the best available science, and uses their professional judgement. Spotted owl recovery is a key decision factor on each proposed logging project, and is considered by the entire district team. As described in the 2011 Revised Recovery Plan for the Northern Spotted Owl, there are a broad range of factors that are affecting owls and different criteria that can be applied to aid in their recovery. Key forest stands are not logged and are protected to provide for the needs of owls and their prey. This does not imply that every stand will be preserved in perpetuity. Our formal consultation process with the U.S. Fish and Wildlife

Comment Number	Comment	Response
		Service for each project that may affect the northern spotted owl allows the Forest Service to review each proposed project, consider effects and how to minimize said effects. No suitable habitat is being removed from the Goose project area around known spotted owl pairs that do not meet the threshold 50% suitable habitat requirement within the 0.5 mile home range radius.
55	The data on competition between the snowy and barred owls is sparse and there is little certainty that the disturbance of the forest would not favor the barred owl. The long period of time in which there would be a loss of spotted owl foraging habitat (as documented in the EIS) is concerning as it provides a greater window of time in which the protected owl is vulnerable to competition from the more generalist barred owl.	Since there are no known sightings of snowy owls on the Willamette National Forest, and they are even somewhat unusual when they do occur in Oregon, we assume the commenter intended to comment about the competition between the northern spotted owl and barred owl. While we agree that there are unknowns, it is not within the scope of the Goose project to conduct research to evaluate competition between the owls and other unknown variables. Consultation with USFWS was completed as required for the Goose project. Please refer to Section 3.5.7, 3.5.8 and Appendix F for a detailed discussion of potential effects to northern spotted owls from the Goose project. Please refer to the USFWS revised recovery plan for additional information on competition between the northern spotted owl and barred owl at http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Recovery/Library/Documents/RevisedNSORecPlan2011.pdf
56	The DEIS suggests the active management will increase early seral habitat in the future necessary for a number of species. In the biological assessment there are no wildlife population numbers and no mention of wildlife species at all with the exception of the critically threatened Bull Trout and Spring Chinook Salmon species. Is it known if there needs to be an increase in populations such as elk, deer, grey fox, black bear, bobcat, and several bird species; with no research or study conducted why is this part of the reasoning for the project when these species could be thriving in current conditions?	Based on the commenter's description of the biological assessment, it would appear you reviewed the *fish* Biological Assessment. There is also a *wildlife* Biological Assessment that was prepared for the Northern Spotted Owl and a *wildlife* Biological Evaluation discusses all species on the U.S. Forest Service Region 6 Strategic Species list with habitat on the Willamette National forest. These documents can be viewed online at http://www.fs.usda.gov/project/?project=45853. Section 3.5.9 through 3.5.20 includes discussion of the effects to some of the species the commenter mentioned including elk, deer, and several bird species.
57	We are skeptical of the "MAII" effect determined for several of the species, including bat species, examined in the biological assessment. Although the proposed logging activity may not "cause a trend toward federal listing", the "adversely impact individuals" □ finding s insouciantly dismissed. Conservation biologists acknowledge the cumulative and numerous threats to biodiversity, and the importance of conserving multiple thriving populations of wildlife to allow a high degree of confidence that species can persist into the future. Since smaller	The Forest Service places more emphasis on individual species management once a species is listed as threatened or endangered. Other than the threatened northern spotted owl, none of the other wildlife species with suitable habitat in the Goose project area has been formally listed at this time. The topic of individual species management vs. ecosystem management is regularly highlighted in the conservation biology literature, and the Forest Service has taken a position of implementing both where it is reasonable and feasible. In the case of the

Comment Number	Comment	Response
	populations are more susceptible to ecological threats, environmental and demographic stochasticity, and loss of genetic diversity, it is sound policy to prevent the loss of individuals from the population. The EIS fails to address this prudent approach.	sensitive bat species in the Goose project area, we cannot rule out that suitable roosting habitat snags would not be lost with the Goose action alternatives. In past harvest projects, any known bat roosting snags/trees have been protected. None are known in the Goose project area.
58	AFRC believes that the context that the Northwest Forest Plan focused on was the landscape. Therefore we like to see individual projects that consider the affected environment in the context of the entire landscape. The discussion on the affects to Northern Spotted Owl Critical Habitat Unit (CHU) appears to be considering a different context, one that reduces the landscape down to individual acres. The summary of effects analysis on page 116 of the Goose EIS states that "because about 54 acres in total of larger gaps that are being created would measurably delay the development of future foraging habitat, the proposed Harvest Habitat Maintain thinning may affect and is likely to adversely affect 2012 spotted owl critical habitat." It is disturbing that the scale for NSO habitat analysis has been lowered down to a gap cut as small as a single acre, particularly in the case of a variable density thinning (VDT) treatment. By design, a VDT treatment considers an entire stand and prescribes variable treatments throughout the stand; this results in varying degrees of thinning, gaps and skips. A paper by Jerry Franklin in 2002 titled "Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example" described this approach well. Here on page 417 the authors suggest that ecologically, it is more useful to view an entire treatment area, including both harvested and unharvested areas, as a functional stand consisting of a mosaic of structural units. When considering the gap cuts on several stands/units on the Goose project, a prudent scale would be, at the minimum (the landscape level would be optimal), the stand level, similar to what Franklin described above. At the stand level the proposed gaps are a component of a larger variable density thinning treatment that contains gaps and skips. In this context the skips within the proposed treatment units would receive equal consideration as the gaps in the NSO CHU affects analysis. At the landscape level, the 12,000+ acres of untreated land in the project area could receive consideration. We strongly urge the Forest Service to start considering the effects of their vegetation management treatments in the proper context identified by their LRMP, which is the landscape.	The criteria for determining whether an action is likely to <u>adversely affect</u> critical habitat (CH) are established in the Final CH rule for NSO (50 CFR Part 17, Vol 77, No. 233, Dec. 4, 2012, pages 71939-71940) in the section entitled "Determining Whether an Action is Likely to Adversely Affect Critical Habitat"). This section notes the changes in effect determination to CH from the 1992 critical habitat to the 2008 critical habitat (forest stand as appropriate scale) to the 2012 proposed critical habitat. The final rule says there are many variables to consider in determining if an action is adverse or not and that there is not a "one size fits all" set of rules due to differences in habitat types, project types, and habitat needs across the range of the owl. The "determination should be conducted at a scale that is relevant to the northern spotted owl life-history functions supplied by the Primary Constituent Elements (PCE) and affected by the project" (p. 71939). The rule notes that this localized scale differs from the scale used to determine if the action <u>will destroy or modify CH</u> (discussed below). The rule provides guidance that Level 1 teams are encouraged to consider when addressing the scale of adverse effects. For PCE 4 (habitat to support the transience and colonization phase of dispersal) the Final Rule indicates the use of a larger scale than other PCEs with suggested potential scales being 5th field landscapes, 6th field landscapes, dispersal corridors, or a relevant landform (p. 71939). For PCEs 2 (habitat that provides for nesting and roosting) and PCEs 3 (habitat that provides for foraging), a more localized landscape is indicated with suggestions that level 1 teams consider the stand scale, a 500-acre circle, or other appropriate localized scale (op cit). For the Goose BA on reconsultation on 2012 CH, the stand scale was used to access effects for PCEs 2 and 3 (nesting/roosting and foraging habitat), with a minimum stand size of one acre. That scale was consistent with the method used by the Willamette Province Level 1 Team for addressing effects to habitat for northern spotted owl consultation at that time. We note AFRC's objection and the Franklin citation that the one acre scale is too small to define a stand. Their comments will be forwarded to the Level 1 Team for their consideration. The Goose BA on reconsultation on 2012 CH concluded that the project <u>adversely affected</u>

Comment Number	Comment	Response
		CH by removal of 2 acres of suitable habitat for road construction and because 54 acres of gaps greater than one acre in dispersal habitat would delay the development of future foraging habitat on those acres where the openings were created. When a BA identifies that the project may result in an adverse effect to CH, the USFWS prepares a Biological Opinion (BO) to determine if the action will destroy or adversely modify CH. Adverse modification of CH is an ESA term akin to jeopardy and means CH is altered directly or indirectly in a manner that reduces the value of the CH for the survival and recovery of the listed species. The criteria for determining whether an action will destroy or adversely modify CH are established in the Final CH rule for NSO (50 CFR Part 17, Vol 77, No. 233, Dec. 4, 2012, pages 71940-71941) in the section entitled "Determining Whether an Action Will Destroy or Adversely Modify Critical Habitat"). This determination is done at the scale of the action area, the affected CH subunit(s), the affected CH unit(s), and the range of the entire designated NSO CH (p. 71940). If the BO concludes (as in the case of the Goose Project) that the action will not destroy or modify CH, the action can be conducted under the ESA (op. cit.). The assessment scale for determining adverse modification of CH is more in line with the landscape scale of the Northwest Forest Plan cited by AFRC.
59	AFRC has general concerns with the entire effects determination to the NSO CHU in the Goose EIS; these effects are described on pages 127-131. Our main concerns are similar to those described in the previous paragraph, which has to do with the scale of analysis. It is disturbing to us that the removal of a mere 2 acres of suitable NSO habitat triggers a "likely to adversely affect" determination on the CHU. Based on some discussion on page 128 of the EIS it seems as though the Forest Service agrees: A loss of two acres represents only a 0.07 percent change in the proportion of old forest habitat in a 1.2 mile radius home range. Based on the information provided by Wiens (2012), this very small decrease in old forest habitat would not produce a measurable change in spotted owl survival or a meaningful increase in competition with barred owls. Yet this immeasurable change in NSO habitat results in an adverse effect to the CHU. In the context of the Critical Habitat subunit WCS 3, which is 319,736 acres, this 2 acre reduction represents 0.0000063% of the subunit. Does the McKenzie RD truly believe that such a minute reduction	As noted in response to comment 58, the final CH rule set no definitive size for determination of adverse effects to CH and Level 1 teams continue to evaluate the issues of scale in making effect determinations. Also there are concerns with the effects of thinning stands (including creating gaps) on flying squirrels and red tree voles. As noted in the Goose BA on reconsultation on 2012 CH (p. 18), there is uncertainty with the long-term effects of opening up stands by thinning on flying squirrels and red tree voles and that negative impacts may persist for a number of decades. That uncertainty influenced the determination of adverse effects to critical habitat from the creation of 54 acres of gaps greater than one acre in dispersal habitat for the Goose project. As noted above, these adverse effects did not rise to the level of adverse modification of critical habitat which evaluated effects at the Critical Habitat Subunit and other larger scales as determined by the Goose Reinitiation BO for Reconsultation on 2012 CH (USFWS reference 01EOFW00-2013-F-0115). In that assessment, the small percentage of the CH in the subunit

Comment Number	Comment	Response
	constitutes a "likely to adversely affect" determination? The Final Critical Habitat Rule published on Dec. 4, 2012 states that: "Actions with effects to the PCEs, physical or biological features, or other essential habitat qualities of northern spotted owl critical habitat that are discountable, insignificant, or wholly beneficial would be considered not likely to adversely affect critical habitat, and do not require formal consultation if the Service concurs in writing with that Federal action agency determination. (FR Vol 77 No 233 Page 71938)" Page 129 of the EIS goes on to state that "gaps greater than one acre in size€¦.are large enough that they would limit future use as red tree vole and flying squirrel habitat€¦which would delay the development of future foraging habitat for at least several decades. This delay is expected to adversely affect CH." Page 130 clarifies that "the planned gaps in the Goose Project in young dispersal habitat avoid high-value owl habitat." By this standard, if the USFS proposes to implement a 1.1 acre gap (which would represent 0.0000034% of the WCS 3 subunit) in this CHU, the result would be an adverse effect to said CHU. These numbers are difficult for AFRC to comprehend. It appears based on the Goose EIS that the bar for adverse effects to the NSO CHU has been set at a single acre of forest that is unsuitable low-value owl habitat. In our opinion this effects analysis disregards best available science, the 2012 Final Critical Habitat Rule as well as common sense.	that was affected (<0.2%) was considered in the determination that the action was insignificant at the subunit scale (BO, p. 44).
Early Seral Habitat		
60	It appears from the DEIS that the Forest Service will be converting 3% of the project area to early seral forest. The DEIS states that less than 1% of the project area is currently early-seral habitat. Does this figure include private lands? Does it estimate or consider nearby private lands where logging is anticipated to occur?	Information regarding logging on private lands is not public information. Estimating "anticipated logging" is not possible as the Forest Service cannot predict when or where logging activities may occur on nearby private land. While some private lands may provide early seral habitat, they do not often provide structurally rich early seral habitat. Diverse quality and structurally rich early seral habitat is of key importance to the estimated 156 species of wildlife that depend on it. Additionally, private timber lands may only provide early seral habitat for five to ten years, as compared to 15-20 years on Forest Service lands.
61	The Forest Service is jumping the gun by attempting to convert scarce older forest into your early-seral forest without first justifying its creation through historical evidence or conducting a full accounting of what is being	Although not specifically stated in the DEIS, analysis of early seral conditions was performed at the watershed level and at the project level. Corrections have been made to Chapter 1 and Chapter 3.5 to clarify the

Comment Number	Comment	Response
	provided by agricultural lands, private forest lands, roadsides, transmission lines, etc. It is simply not sufficient to say that there was anywhere from 5% to 30% of the entire Pacific Northwest in early-seral conditions in the past to justify its creation in west-side Cascade high-elevation rainforest. The Forest Service must use its project area level or at the very least watershed level of analysis.	level of analysis. As stated in Swanson et al. 2014, "The percentage of the regional landscapes of the Pacific Northwest in early succession was historically highly variable in space and time, but reconstructions demonstrate a greater than 50 percent reduction in the proportion of the landscape in a pre-canopy closure condition when comparing the 19th and 20th centuries to the present." They go on to state: "When the focus is further restricted to structurally complex early-seral pre-forest conditions, such as those generated by natural disturbances and with abundant biological legacies, the proportion of the modern landscape in such a condition is even more likely lower than in the past. As in many commodity-producing forest regions, harvest created younger classes are currently well represented in the PNW, but widespread management practices have emphasized dense, homogenous conifer establishment and rapid canopy closure in young stands, effectively truncating or skipping the early-seral pre-forest stage." The Goose project area occurs in three 6th field watersheds: Lost Creek, Florence Creek-McKenzie River, and Elk Creek-McKenzie River. Within these watersheds, approximately 30,164 acres of forest land are managed by the Forest Service. Within this 30,164 acres only 43 acres (0.14%) is less than 20 years old. Of the 43 acres of early seral habitat in these watersheds, 15 acres occur in the Goose project area. Eight acres are located in the Lost Creek watershed; six in the Florence Creek-McKenzie River watershed; and one in the Elk Creek-McKenzie River watershed. The Goose project would create approximately 420 acres of early seral habitat with gaps, regeneration harvest, and dominant tree release. At the watershed level, this would increase early seral habitat from 0.14 percent to 1.5 percent. At the project level, this would increase early seral habitat from 0.11 percent to 3.2 percent. Of interest, 12,087 acres (40.1%) of Forest Service land in these watersheds is old growth 180 years or older.
62	The DEIS is misleading because it mixes spatial scales. The DEIS (p.2) says "Currently, there is less than one percent early seral habitat (defined as less than 20 year old) in the project area. At any point in time, a forest	Corrections have been made in Chapter 1 and 3.5 to clarify spatial scales and levels of analysis for early seral habitat.

Comment Number	Comment	Response
	landscape in the Pacific Northwest (east and west of the Cascades Range) should be composed of 5-20 percent early seral habitat (Swanson 2012)." The 5-20 percent range applies to a larger landscape than just the project area. Landscapes varied much more widely at smaller spatial scales.	
63	The analysis in the DEIS does not predict or attempt to analyze the amount of early seral that will be created in the Pacific Northwest from fire. There are an ever-increasing amount of fires across the landscape but the Forest Service and BLM continue to salvage log these stands. If the agency is serious about the need for high value early seral habitat, it should not be salvage logging, and the analysis should model and predict the amount to be created by future fires, taking into account the increasing frequency and severity of these fires from climate change.	At this time, it is not possible to model or predict when and where a fire will occur or how large it will be. As such, it is not possible to predict how much early seral habitat will be created from fires that have not yet occurred.
Roads and Access		
64	Ranger Baker, if you were really concerned about aquatic species' health you would indicate in the final EIS that all newly constructed temporary roads will be obliterated after use and apply the obliteration method that returns the ground to the natural angle of repose and eliminates the running surface. Not doing so clearly indicates you have no intent of using the road temporarily. Comment: Roads that will be used again in the future must be constructed to system road standards with surfacing and a ditch to reduce sediment generation. If the final EIS does not clearly indicate that your proposed temporary roads will be obliterated such that a running surface no longer exists, it will show you plan to allow these temporary roads to pump sediment for decades until the so-called temporary road is used again for the next timber sale. Please become familiar with the Clean Water Act.	"Decommissioning" as described in the Draft and Final EIS is consistent with the most common definitions of "obliteration" including those described in several articles the commenter referenced in his letter. Please see Chapter 2, Table 13, Design Feature 27 and definitions included in the Glossary for additional information.
65	Temporary roads would be decommissioned after completion of project activities. Decommissioning of temporary roads would include one or more of the following: removal of any rock, blocking the entrance, removal of culverts, out-sloping the road surface, pulling back displaced material onto the road way, installation of water bars, re-vegetation of the road prism, and sub-soiling of compacted surfaces. " Comment: Since temporary roads are out sloped with no ditch, sediment that is generated during precipitation events, finds its way to streams and harms the aquatic resources for decades after initial construction â€¦ unless the road is	"Decommissioning" as described in the Draft and Final EIS is consistent with the most common definitions of "obliteration" including those described in several articles the commenter referenced in his letter. Please see Chapter 2, Table 13, Design Feature 27 and definitions included in the Glossary for additional information.

Comment Number	Comment	Response
	obliterated. No other post-use treatment method (including decommissioning as described above) is as effective at eliminating damage to aquatic resources and subsurface water flow as obliteration. You know this. The reason you aren't obliterating the temp roads is because you plan to use them again when the area is logged next time. Indeed, the line-officers on the Willamette National Forest do not construct temporary roads.	
66	After the temp roads are obliterated or decommissioned they must be monitored over time to assure they are not generating sediment. This DEIS contains no such monitoring plan. The forest service discusses the need to monitor road decommissioning methods: "Several national forests have developed road decommissioning monitoring plans. This report builds on their hard work and careful thought to creating a successful monitoring plan. Instead of advocating one method or process for each monitoring project and budget, this document enables selection of the monitoring technique(s) for each situation.	The Forest Service recently published a technical guide titled: *National Best Management Practices for Water Quality Management on National Forest System Land* (FS 990a). This guide provides forms and protocols that are used for post-project monitoring.
67	The DEIS mentions nothing about the need to secure NPDES permits for the roads planned to be constructed for this timber sale. Ranger Baker, the DEIS contains nothing to indicate temp road monitoring will occur as part of this project. Why?	The U.S. Supreme Court reversed the Ninth Circuit Court's decision in Decker v. NEDC in 2013; the State of Oregon does not require NPDES permits for roads associated with logging.
68	Request for changes to be made to the final NEPA document: Indicate all temporary roads will be obliterated after use making sure to define road obliteration using the statement below (or something similar) to eliminate confusion: When roads are obliterated the road running surface is completely eliminated from the landscape. Full recontouring is accomplished by recovering all available fill and placing it back in the cutbank until the surrounding terrain is fully matched. Include a link to the NPDES permits for the roads planned to be constructed for this timber sale. Also, assure the final NEPA document describes the road obliteration monitoring plan to assure the sediment is being reduced as expected, and indicate the Willamette National Forest will budget funding for the monitoring.	Please see response to comment 64, 65, 66, and 67.
69	The Forest Service is building extensive new roads with this project. The Final EIS should analyze the potential impacts on recreation new roads will have on this high use area. New roads not only attract illegal off road vehicle use but also attract trash dumping, firearm waste, littering, and other illegal activity. These activities could impact the desirability of the	No new permanent roads are proposed in the project. Any temporary roads will be decommissioned which includes eliminating accessibility.

Comment Number	Comment	Response
	area and its appeal to recreationists. These activities and construction could also impact the wilderness character of the area. Please address these issues in the final EIS.	
70	The EIS states that temporary roads will be decommissioned and existing roads will be enhanced. It does not detail the certainty of budget to accomplish these plans.	Temporary road decommissioning is a required design feature of the proposed project (see Table 13). Funding for decommissioning of temporary roads and enhancement of existing roads is secured through the timber sale contract.
71	The impacts from new roads will be significant, and create a future burden on road maintenance efforts. The additional vehicle traffic will increase the impacts on many of the forest landscape values.	The future burden on road maintenance efforts was considered during development of the proposed project. As a result, no new permanent roads are proposed. Temporary roads would be decommissioned upon completion of the project which eliminates the need for road maintenance and would not increase vehicle traffic.
Heritage Resources		
72	The Forest Service states in its DEIS that historical cultural and archeological sites have been discovered nearby and were damaged by past timber harvest activities. The DEIS is vague however in disclosing how further damage to other potential sites is going to be prevented. It appears no comprehensive or even strategic archaeological surveys were conducted to determine whether or not there was a potential site that would certainly be impacted by commercial logging and road building activities. It seems unlikely that logging employees will be able to properly identify or recognize these sites during ongoing commercial operations, the DEIS's plan of dealing with these sites when they are found during logging is insufficient given that other sites have been found in the project area previously.	A systematic surface pedestrian archeological survey was performed by ten crew members in 2009. Details of the archaeological survey and methodology were included in the DEIS and can be found in the FEIS in Section 3.8.3. The Goose project was designed to avoid and protect all cultural sites identified in the survey. Design Features 75-78 (Chapter 2, Table 13) have been put in place to protect any unidentified cultural resources encountered during the course of the project.
Scenery		
73	The proposed regeneration harvests are illegal because they subvert natural landscape appearances to timber generation. The regeneration units are proposed for Management Area 11e, where "multiple use activities [timber harvest] will be conducted in such a way that they are completely subordinate to the character of the natural landscape and not evident to the casual Forest visitor." Where the proposed gap creation never over a few acres may blend with the natural landscape, large clearcuts at least 10 acres in size and even some of the larger gaps will	Regeneration harvest is not proposed in Management Area 11e. Units proposed for regeneration harvest do not have frontal views and are not visible from Highway 126. Treatments proposed in Management Area 11e would meet all Forest Plan standards and guidelines for scenic resources. Treatments proposed in Management Area 11e will be conducted in such a way that they are completely subordinate to the character of the natural landscape and not

Comment Number	Comment	Response
	certainly be noticeable for decades to come. This, as recognized in the DEIS, is one of Oregon most scenic passages, and the Willamette Forest Plan limits even aged management to areas of 3 acres with frontal views. Some of the regeneration harvest units have frontal views, and are completely visible from Highway 126..	evident to the casual Forest visitor.
Recreation		
74	Approximately 1250 acres which would be logged in the event the USFS should choose alternative 2, is located along a popular hiking trail. It is a roadless tract and has the potential for wilderness designation. The forest in this area is unparalleled in its pristine beauty, has generally minimal underbrush, vigorous health, year round and seasonal creeks with the canopy at a very high level, is naturally fire and disease resistant. The EIS states that the public would benefit in its ability to enjoy this area because the road leading to it would be better to travel with more scenic vistas and a bigger parking lot. Those people who would seek out pristine wilderness do not typically do so because of the size of the parking lot or the quality of the road. They're attracted by natural unspoiled beauty. Logging this area would not enhance the appeal to the recreationist, it would simply spoil the experience. The only conceivable justification for logging this section is the dollar value of the timber. If in fact this area represents an insignificant percentage of the land the USFS manages in the area, it would seem that the highest and best use of this area would be left to the recreation oriented public and logs should be extracted from areas not otherwise accessible to the public or as scenically desirable as is this tract.	No Inventoried Roadless Areas (IRAs) or designated Wilderness is within or adjacent to the project area. Inventory of areas that may be suitable for inclusion in the National Wilderness Preservation System has been dropped from the Goose project. Please see response to comment 79 for additional information. Approximately .85 miles of the Frissell Trail passes through units proposed for treatment in the Goose project. Unit 460 encompasses the trail head parking area and the trail passes through units 470 and 480. Design features have been put in place to protect Frissell Trail during and after implementation of the Goose project (see Chapter 2, Table 13, Design Feature 80). Road improvements associated with harvest activity would improve the comfort and quality of the access road to the trailhead. The current parking area is small requiring vehicles to park on steeply inclined slopes off of the road bed which results in resource damage and creates congestion when multiple vehicles are parked. Improvements to the road and parking area will result in better access to the trailhead, less damage to resources, and increased safety for trail users. Improved road and trailhead conditions are not expected to significantly increase use of Frissell Trail and will generally serve to enhance access to those visitors that do seek this trail out as a recreational opportunity.
Inventoried Roadless Areas (IRAs) and Wilderness		
75	Please also drop all proposed logging units within unroaded areas, and pay special attention to minimizing impacts to Wilderness or roadless areas when logging nearby.	No Inventoried Roadless Areas (IRA) or designated Wilderness are within or adjacent to the Goose project area.
76	Before logging roadless areas the agency should consider the impacts to all the values of roadless areas, including: (1) High quality or undisturbed soil, water, and air; (2) Sources of public drinking water; (3) Diversity of plant and animal communities; (4) Habitat for threatened, endangered,	No Inventoried Roadless Areas (IRA) or designated Wilderness are within or adjacent to the Goose project area.

Comment Number	Comment	Response
	proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; (5) Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation; (6) Reference landscapes; (7) Natural appearing landscapes with high scenic quality; (8) Traditional cultural properties and sacred sites; and (9) Other locally identified unique characteristics. 36 CFR Â§294.11	
77	It's nice that the FS has prepared an EIS to consider the effects of logging in the 10,000 acre Lookout Mountain unroaded area, but the DEIS fails to take a hard look at the science about the value of these areas and fails to fully disclose the adverse effects of logging and the many ecological benefits of letting these forests under the influence of natural processes. Former Secretary of Agriculture Tom Vilsack recognizes the value of National Forest roadless areas: "Roadless areas preserve essential watersheds and help ensure an abundant supply of clean drinking water. These large areas of undisturbed forests provide diverse habitats for sensitive and endangered wildlife. In addition, roadless areas provide other critical ecological services, such as carbon storage, and operate as effective barriers to invasive species, while also providing social values such as scenic landscapes and a host of recreational opportunities.	The Lookout Mountain unroaded area referenced by the commenter is not recognized by the USFS. No inventoried roadless areas or designated wilderness is within or adjacent to the Goose project area.
78	Please take a harder look at the wilderness and roadless area values and balancing of these values in the FEIS.	No Inventoried Roadless Areas (IRA) or designated Wilderness are within or adjacent to the Goose project area.
Areas that May Be Suitable for Inclusion in the National Wilderness Preservation System (NWPS)		
79	AFRC is concerned and a bit confused by the consideration of "areas that may be suitable for inclusion in the National Wilderness Preservation System" in this analysis. The EIS acknowledges on page 211 that "the wilderness recommendation process typically occurs during forest planning, in some cases the first step, inventory, occurs at project level analysis." However, based on your handbook, we disagree. In fact, the Forest Service Handbook (FSH) that is referenced in this affects analysis is titled "Land Management Planning". FSH 1909.12 states in its heading: "This handbook provides procedural guidance for implementing land management planning direction for the 2012 planning rule (77 FR 21165, April 9, 2012). The primary use is for interdisciplinary team members and line officers responsible for planning." We are unclear as to how utilizing and referencing a FSH section on land management planning is	Inventory of “areas that may be suitable for inclusion in the National Wilderness Preservation System” has been dropped from the Goose project. Previous USFS direction in Region 6 directed forests to perform an inventory of areas that may be suitable for inclusion in the NWPS during project level analysis. On January 30, 2015, the USFS released new directives that clearly state inventory, evaluation, and recommendation of areas that may be suitable for inclusion in the NWPS shall occur during *forest plan development* or *revisions* (FSH 1090.12). The Responsible Official for the Goose Project originally made the determination to keep the “inventory” of these potentially suitable areas in

Comment Number	Comment	Response
	appropriate at the project level. NEPA's primary purpose is to aid in informed decision making. We feel that the discussion and consideration of potential wilderness areas is contrary to this notion, and in fact may result in unsound decision making.	the Goose DEIS because it was included in the Goose Environmental Assessment and subsequent Finding of No Significant Impact and Decision Notice and was a point of concern that constituted "significance" base on Judge Aiken's ruling in *Cascadia Wildlands and Oregon Wild vs USFS.* However, after evaluating multiple public comments addressing this issue and further review of the new directives, the Responsible Official has determined that inventory of areas that may be suitable for inclusion in the NWPS shall be done at the forest planning level as directed by FHS 1909.12. As such, the inventory has been dropped from the Goose project.
80	The FS continues to rely on a flawed inventory of potential wilderness areas. The DEIS says "A 200 foot setback for all forest roads and a 500 foot setback from highways, which is the standard boundary distance for current wilderness areas on the Willamette National Forest. The 200 foot buffer was also applied to power lines." Instead of excluding areas simply because they are near a road, the Forest Service must follow its internal guidance (effective 1/30/2015) for "broad and inclusive" identification of potential wilderness, and public involvement in that process. The FS Planning Handbook says: The primary function of the inventory step is to efficiently, effectively, and transparently identify all lands in the plan area that may have wilderness characteristics as defined in the Wilderness Act.	Please see response to comment 79.
81	The Responsible Official shall ensure that the Interdisciplinary Team documents the evaluation. "The intent is to ensure that the process for inventory and evaluation is transparent and accessible to the public for input and feedback." Evaluate the degree to which the area has outstanding opportunities for solitude or for a primitive and unconfined type of recreation. The word "or" means that an area only has to possess one or the other. The area does not have to possess outstanding opportunities for both elements, nor does it need to have outstanding opportunities on every acre.	Please see response to comment 79.
Economics		
82	The Forest Service should model and quantify the financial benefits generated from tourism in the community, and discuss potential impacts to this revenue from the project's implementation.	An analysis of financial benefits generated from tourism is beyond the scope of this project. Currently, there is no data or information available to suggest tourism in the upper McKenzie River area is impacted by logging activities. Tourism and recreational activities connected with Forest Service lands continue to increase in the upper McKenzie River area.

Comment Number	Comment	Response
83	This EIS should, but does not, disclose an economic analysis of the comparative values of resource extraction and the considerable contribution to local economies in Oregon from tourism and recreation.	An economic analysis of the comparative values of resource extraction and the considerable contribution to local economies in Oregon from tourism and recreation is beyond the scope of this project.
Climate Change		
84	The NEPA analysis should start with an accurate and up-to-date inventory of carbon storage and carbon flows on federal land. This is required by NFMA and FLPMA.	An inventory of carbon storage and carbon flows on Federal land is beyond the scope of this project. A baseline estimate of carbon stocks in forests and harvested wood products for National Forest System Units in the Pacific Northwest Region was released on March 6, 2015. Total forest ecosystem carbon stored in the Pacific Northwest Region increased from 2005 to 2013, with 2304 teragrams (Tg) in 2005 and reaching 2370 Tg in 2013. The Willamette National forest stored the largest amount of carbon in the region, approximately 243 Tg in 2005 and 248 Tg in 2013 (USDA 2015).
85	The DEIS did not adequately address the effect on climate change from this timber sale or its impact on climate change from surrounding and adjacent timber harvest.	Considering emissions of GHG in 2010 was estimated at 49 ± 4.5 gigatonnes globally (IPCC 2014) and 6.9 gigatonnes nationally (US EPA, 2015), a project of this magnitude makes an infinitesimal contribution to overall emissions. Therefore, at the global and national scales, the proposed action's direct and indirect contribution to greenhouse gasses and climate change would be negligible. In addition, because the direct and indirect effects would be negligible, the proposed action's contribution to cumulative effects on greenhouse gasses and climate change would also be negligible. The Intergovernmental Panel on Climate Change has summarized the contributions to climate change of global human activity sectors in its Fifth Assessment Report (IPCC 2014). In 2010, anthropogenic (human-caused) contributors to greenhouse gas emissions came from several sectors: industry, transportation, and building – 41%; energy production accounts – 35%; agriculture – 12%; forestry and other land uses accounts – 12%. There is agreement that the forestry sector contribution has declined over the last decade (IPCC, 2014; Smith et al., 2014; FAOSTAT, 2013). The main activity in this sector associated with GHG emissions is deforestation, which is defined as removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed

Comment Number	Comment	Response
		landscapes (IPCC 2000). This Goose project does not fall within any of these main contributors of greenhouse gas emissions. Forested land will not be converted into a developed or agricultural condition. In fact, forest stands are being retained and thinned to maintain a vigorous condition that supports trees, and sequesters carbon long-term. US forests sequestered 757.1 megatonnes of carbon dioxide after accounting for emissions from fires and soils in 2010 (US EPA, 2015).
86	Deforestation contributes significantly to a loss of carbon storage and increased instability in climate regulation. Though the contribution of this project to deforestation may seem small, our reaction to it can have an impact on the precedent we set for future logging projects. In a time of rapid climate change and ecosystem vulnerability, we cannot afford to be losing what forests we have left.	Deforestation is defined as permanent removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000). Forested land in the Goose project area will not be converted into a developed or agricultural condition. Forest stands are being treated to maintain a vigorous condition that supports trees and sequesters carbon long-term.
List of Preparers		
87	The DEIS does not list an IDT member with the education, experience or knowledge to adequately and professionally assess and divulge the environmental effects of sale implementation in on scenery. The public expects the USFS to staff their IDTs with professionals who specialize in the resources they represent. Chapter 3 contains a section describing the effects to Scenic Quality from implementing the Goose timber sale, yet there is no landscape architect listed as an IDT member. Request for changes to be made to the final NEPA document: Add a landscape architect to the IDT and have him/her professionally assess and re-write and effects of logging and roading activities on the scenery resource. Also, assure that this landscape architect is named as an IDT member.	A licensed landscape architect (LA) performed a scenery evaluation and reviewed Chapter 3.9 – Scenic Quality between the DEIS and FEIS. Recommendations made by the LA have been incorporated into project design (e.g. 28 gaps changed to thinning in Unit 10 to maintain scenery objectives). Design features have been added to Chapter 2.6 to ensure scenic quality and integrity is maintained. The LA has been added to the interdisciplinary team and included in the List of Preparers. Please see Chapter 3.9 and the List of Preparers for additional information.
88	Request for changes to be made to the final NEPA document: Rewrite the Environmental Consequences Chapter with new IDT members and instruct them to 1) include accurate, professional, complete, honest effects disclosures, and 2) provide unbiased, independent science (not authored by a USDA employee) that supports the natural resource effects disclosures.	The effects of the Goose project were analyzed by professional natural resource, recreation, and cultural specialists. The effects of each alternative were predicted based on science literature and professional experience of the IDT specialists. The conclusions of the IDT specialists are based on the best available science and current understanding.
Appendices		
89	At page 30 you say: "Other issues are represented and expressed in	Thank you for pointing out the error regarding Appendix F. This has been

Comment Number	Comment	Response
	Appendix F, where you can find specific comments about the proposed action and responses." Appendix F contains 6 pages of effects to known owl sites. Appendix F does not contain the word "issues."	corrected in the FEIS.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF ECOSYSTEMS, TRIBAL AND PUBLIC AFFAIRS

April 20, 2015

Terry Baker, District Ranger
McKenzie River Ranger District
57600 McKenzie Highway
McKenzie Bridge, OR 97413

Dear Mr. Baker:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Goose Project (Project) on the McKenzie River Ranger District of the Willamette National Forest (EPA Project #14-0022-AFS). Our review was conducted in accordance with EPA responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act (CAA).

The DEIS analyzes the Forest Service's proposal to implement vegetation and fuels treatments that would provide timber products, reduce hazardous fuels in the McKenzie Bridge Wildland Urban Interface (WUI), and improve stand conditions, diversity, density and structure in the project area. Two action alternatives and a no action alternative were analyzed. Alternative 2 proposes 2,452 acres of treatment; 1,592 acres of timber harvest, 502 acres of skips, and 358 acres of WUI fuels treatment. In Alternative 3, the Forest proposes 1,069 acres of treatment, 610 acres of timber harvest, 134 acres of skips, and 325 acres of WUI fuels treatment. Alternative 2 is the Forest Service proposed action and preferred alternative.

The EPA is supportive of the overarching goals and objectives of the proposed project, and we find the DEIS to be clear, well organized, and robust. We appreciate the additional analysis, as well as the project modifications proposed to address resource concerns identified, following the issuance of the 2010 environmental assessment for this project. In particular, we appreciate the site specific analysis and attendant modifications to treatments within the riparian reserves.

Although we concur with the conclusions and recommendations in the DEIS, we would offer some perspective on the analysis in Section 3.4.5 (Environmental Consequences – Stream Shade and Temperature). This section (page 104) states that, "Research has shown that in many cases significant changes in stream temperature are not observed with partial no-harvest buffers within the Riparian Reserve width." It is the view of the EPA that the limited number of studies which have specifically evaluated thinning in riparian buffers makes it difficult to generalize about the potential impacts to stream temperature from this specific activity, particularly given the many different possible combinations of thinning intensity and buffer width. We would also note that the EPA has over time expressed some concern over the use of primary shade zones in determining riparian buffer widths. This concern stems in part from the method's exclusion of potential solar loading before 10 a.m. and after 2:00 p.m. We are able to support the prescriptions in the Goose project because of the site specific analysis included in the DEIS and the decision to consider both primary and secondary shade zones as prescriptions were developed. Had the Project taken a less site specific approach to prescription development, we would have recommended that the no harvest buffer on Class 3 streams be extended to 80 feet, and that the no harvest zone on Class 4 streams be extended to 50 feet.

Based on our review, we are rating the DEIS as LO (Lack of Objections). We appreciate the opportunity to review and comment on the DEIS. If you have any questions about our review, please contact me at (206) 553-1601, or by electronic mail at reichgott.christine@epa.gov. Or you may contact Teresa Kubo of my staff at 503-326-2859 or by electronic mail at kubo.teresa@epa.gov.

Sincerely,

For

Christine B. Reichgott, Manager
Environmental Review and Sediment Management Unit

2

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
620 SW Main Street, Suite 201
Portland, Oregon 97205-3026

IN REPLY REFER TO:
9043.1
ER15/0150

Electronically Filed

April 17, 2015

Terry Baker, District Ranger
McKenzie River Ranger District
57600 McKenzie Highway
McKenzie Bridge, OR 97413

Dear Ms. Baker:

The Department of the Interior has reviewed the Draft Environmental Impact Statement for the U.S. Forest Service Goose Project, McKenzie River Ranger District, Willamette National Forest Lane County, Oregon. The Department has no comments on the document at this time.

We appreciate the opportunity to comment.

Sincerely,

Allison O'Brien

Allison O'Brien
Regional Environmental Officer

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Appendix H – Changes between Draft and Final EIS

In response to public comment and a comprehensive internal review, multiple changes were made between publication of the Goose Draft Environmental Impact Statement (DEIS) and this Final Environmental Impact Statement (FEIS). Most of the changes were minor in nature and focused on grammatical corrections, editorial formatting, and clarification of data previously presented. These minor changes are not included here.

In some situations, more substantive changes were required to clarify issues, expand on analysis, or provide additional information. Substantive changes are outlined in the table below. **This FEIS prevails regarding any differences or conflicts with the DEIS.**

Location in DEIS	Change between DEIS and FEIS
Chapter 1	
Section 1.1	Legal description corrected.
Section 1.7	Updated to reflect additional public involvement between DEIS and FEIS.
Section 1.9.1	Content added for clarification of key issues, other issues, and out of scope issues.
Chapter 2	
Section 2.5	Design features added to protect soils, roads, and scenic quality.
Chapter 3	
Section 3.1.4	Figure 11 moved to Section 3.5.4.
Section 3.2.4	Corrections made to WUI treatment acres in Table 22. Hazardous fuels treatments completed in 2014 added to cumulative effects analysis.
Section 3.3.4	Information added to clarify soils conditions in Unit 100 and 410.
Section 3.5.3	Information added to clarify scale of analysis.
Section 3.5.8	Corrections made to age class acres in Table 31.
Section 3.9	Figure 33, 35, and 36 removed. Figure 34 and 37 updated. Viewpoint analysis removed. Information added to clarify visual quality objectives.
Section 3.11	Inventory of areas that may be suitable for inclusion in the National Wilderness Preservation System removed from project.
Section 3.14	Information added to reflect updated IPCC reports.
Chapter 4	
List of Preparers	Forest Landscape Architect added to List of Preparers.
Chapter 5	
List of Agencies, Governments and Individuals	Updated to include information regarding DEIS 45-day comment period.
Appendices	
Appendices	Appendix G – Response to Comments added. Appendix H – Changes between DEIS and FEIS added.

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Glossary

A

Advanced Regeneration - Small trees, usually less than 1 inch in diameter, which are growing under mature trees prior to planned harvest activities.

Air Quality The composition of air with respect to quantities of pollution therein; used most frequently in connection with "standards" of maximum acceptable pollutant concentrations. Used instead of "air pollution" when referring to programs.

Allochthonous Energy Sources - Allochthonous energy sources are those derived from outside the stream system, that is, from the terrestrial environment. Leaves, twigs, fruits, etc. are typical forms that enter the water by direct litterfall or lateral leaf blow.

Ambient Air Quality- defined under the Clean Air Act as the air quality outside of industrial site boundaries.

Arterial Road – A forest road that provides service to large land areas and usually connects with other arterial roads or public highways.

Autochthonous Energy Sources Autochthonous energy sources are those derived from within the stream system. During photosynthesis, for example, primary producers form organic carbon compounds out of carbon dioxide and inorganic matter. The energy they produce is important for the community because it may be transferred to higher trophic levels via consumption.

C

Canopy - The uppermost spreading branchy layer of a forest.

Canopy Base Height – The height above the ground of the first canopy layer where the density of the crown mass within the layer is great enough to support vertical movement of a fire. Low canopy base heights have been shown to initiate crown fire behavior.

Canopy Bulk Density - Canopy bulk density (CBD) describes the density of available canopy fuel in a stand. It is defined as the mass of available canopy fuel per canopy volume unit.

Canopy Cover - Canopy cover is a measure of the percentage of ground covered by a vertical projection of the tree canopy.

Canopy Closure - Canopy closure is the proportion of the sky hemisphere (measured from all angles) obscured by vegetation when viewed by a single point. Closure is affected by tree heights and canopy widths and takes into account light interception and other factors that influence microhabitat.

Chain – A standard measurement equal to 66 feet.

Class I Airsheds - Geographic areas designed by the Clean Air Act subject to the most stringent restrictions on allowable increment of air quality deterioration. Class I areas include Forest Service wildernesses and nation memorial parks over 5,000 acres, National Parks exceeding 6,000 acres, international parks, as well as other designated lands.

Cohort – A group of trees developing after a single disturbance, commonly consisting of trees of similar age, although it can include a considerable range of tree ages of seedling or sprout origin and trees that predate the disturbance.

Condition Classes - A function of the degree of departure from historical fire regimes. Condition class 1 is within or near historical conditions; class 3 is significantly altered from historical regimes.

Contiguous- In close proximity to or near.

Core Area - 0.5 mile (radius circle) around a known or predicted owl site, which delineates the area most heavily used during the nesting season for nesting, foraging and rearing young. Bingham & Noon (1997) defined the core area as that portion of a northern spotted owl home range that received disproportionately high use for nesting, roosting and access to prey; they suggested that 60-70 percent of owl reproducing season activity occurred in about 20 percent of the home range. Although Courtney et al. (2004:5-5) observed that core area sizes varied greatly among owls, Thrailkill (pers. com.) determined that Bingham & Noon 1997, Wagner & Anthony 1999, Franklin et al. 2000 and Irwin et al. 2004 collectively suggested a core area of about 500 acres.

Collector Road - A forest road that serves smaller land areas than an arterial road. Usually connects forest arterial roads to local forest roads or terminal facilities. (FSH 7709.54, no longer in print)

Critical Habitat (NSO)– The critical habitat designation is conducted by the U.S. Fish and Wildlife Service and is based on the current status and recent scientific research on northern spotted owl populations. Critical habitat was identified for specific areas within the geographical area occupied by the species at the time it was listed, on which are found those physical or biological features essential to the conservation of the species, and which may require special management considerations or protection. For the northern spotted owl, these features include particular forest types that are used or likely to be used by northern spotted owls for nesting, roosting, foraging, or dispersing habitat. In addition, the best available information was used to identify those areas that are otherwise determined to be essential to the conservation of the species. A habitat network was identified that meets the following criteria:

- Ensures sufficient habitat to support stable, healthy populations across the range, and also within each of the 11 recovery units
- Ensures distribution of northern spotted owl populations across the range of habitat conditions used by the species
- Incorporates uncertainty, including potential effects of barred owls, climate change, and wildfire disturbance risk
- Recognizes that these protections are meant to work in concert with other recovery actions, such as barred owl management.

Critical Habitat (Fish) - On September 30, 2010, the U.S. Fish and Wildlife Service designated critical habitat for bull trout throughout their U.S. range. Approximately 18,795 miles of streams and 488,252 acres of lakes and reservoirs in Idaho, Oregon, Washington, Montana and Nevada were designated as critical habitat for the wide-ranging fish. In Washington, 754 miles of marine shoreline also were designated. The designation, developed by a team of federal scientists with input from peers outside the agency, is intended to provide sufficient habitat to allow for genetic and life history diversity, ensure bull trout are well distributed across representative habitats, ensure sufficient connectivity among populations and allow for the ability to address threats facing the species.

On September 2, 2005, the National Marine Fisheries Service designated critical habitat for the Upper Willamette River chinook salmon Evolutionarily Significant Unit, which includes naturally spawned spring-run Chinook salmon originating from the Clackamas River and from the Willamette River and its tributaries above Willamette Falls. Also, spring-run Chinook salmon from six artificial propagation programs:

- McKenzie River Hatchery Program (Oregon Department of Fish and Wildlife (ODFW) Stock #23)

- Marion Forks Hatchery/North Fork Santiam River Program (ODFW Stock #21)
- South Santiam Hatchery Program (ODFW Stock #24) in the South Fork Santiam River and Mollala River
- Willamette Hatchery Program (ODFW Stock #22)
- Clackamas Hatchery Program (ODFW Stock #19)

Within these areas, the primary constituent elements essential for the conservation of these ESUs are those sites and habitat components that support one or more life stages, including freshwater spawning and rearing sites, freshwater migration corridors, estuarine areas, nearshore marine areas, and offshore marine areas.

Crop Trees -Trees which are considered suitable to meet long term management objectives for an analysis area. These may also be referred to as healthy or manageable trees. This may include both the physical make-up of the tree as well as the species.

Cycle - As applied to uneven-aged management, it is the time interval between harvest entries. It should be noted that harvest entries in uneven-aged management are to leave residual levels of growing stock which should not need treatment for at least one cycle length.

D

Desirable Species - Any species of plant or animal which is considered to be compatible with meeting management goals and objectives.

Discounted Cost - Value of all cost associated with a project over its lifetime multiplied by a discount rate to determine the costs at today’s worth.

Discounted Revenue - Value of all revenue associated with a project over its lifetime multiplied by a discount rate to determine the value today.

Net Present Value - Difference in Discounted Revenue and Discounted Cost to evaluate if a project would have a positive or negative return on investment.

Disturbance - Events that disrupt the stand structure and/or change resource availability or the physical environment (Oliver 1996).

Diameter Breast Height (DBH) – Diameter of a tree measured 4.5 feet up from the ground on the uphill side.

E

Early Seral - Plants which inhabit a disturbed site within the first few years subsequent to the disturbance.

Early Seral Habitat – A forest structural condition that lasts 15-20 years after a human disturbance such as timber harvest, or natural disturbance such as wildfire. This structural condition can provide valuable wildlife habitat components including grasses, flowering forbs, hardwoods, and dead wood habitat structures.

Emissions - A release of combustion gases and aerosols into the atmosphere.

F

Fire Behavior – The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Intensity -The product of the available heat of combustion per unit of ground and the rate of spread of the fire, interpreted as the heat released per unit of time for each unit length of fire edge. The primary unit is British thermal unit (Btu) per second per foot (Btu/sec/ft) of fire front. Also, the rate of heat release per unit time per unit length of fire front. Numerically, it is the product of the heat yield, the quantity of fuel consumed in the fire front, and the rate of spread.

Fire Regime - A function of the historical frequency of fire and the degree of severity of those fires.

Fire Regime Condition Class - Depiction of the degree of departure from historical fire regimes, possibly resulting in alternations of key ecosystem components. These classes categorize and describe vegetation composition and structure conditions that currently exist inside the Fire Regime Groups. Based on the coarse-scale national data, they serve as generalized wildfire rankings. The risk of loss of key ecosystem components from wildfires increases from Condition Class 1 (lowest risk) to Condition Class 3 (highest risk).

Fire Severity - Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time.

Flame Length - The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity.

Fuel Class - Part of the National Fire Danger Rating System (NFDRS). Group of fuels possessing common characteristics. Dead fuels are grouped according to 1-, 10-, 100-, and 1000-hour time lag, and living fuels are grouped as herbaceous (annual or perennial) or woody.

Fuels - Vegetative matter, dead or alive, that burns in a fire. It is broadly characterized by the following categories:

- Surface or ground fuels are within a foot or so of the ground surface.
- Ladder fuels exist when you have a continuous vertical arrangement of fuel that allows fire to easily go from ground level into the tree canopy.
- Crown fuels are the tree limbs and leaves that can burn with enough heat and/or wind.
- Live fuels are the green (live) herbs and shrubs.

Fuel Models - Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

G

Group Selection - A stand management method in which silviculturists identify groups of trees which need to be removed from a stand of trees in order to meet management objectives.

H

Habitat Modification; Habitat Downgraded: Refers to silvicultural activities that change spotted owl suitable habitat to dispersal habitat; Habitat Removed: Refers to silvicultural activities that 1) Alter spotted owl suitable habitat such that it no longer supports nesting, roosting, foraging, and dispersal (i.e., suitable habitat becomes non-habitat after treatment) or 2) Alter spotted owl dispersal habitat so that the habitat no longer supports dispersal (i.e., dispersal habitat becomes non-habitat after treatment).

Home Range - An estimated area for habitat use of a spotted owl pair. For the Oregon Cascades, this estimate is 1.2 miles (radius circle) around a known or predicted owl site (Thomas et al. 1990, USDI et al. 2008).

Hyporheic Flow - Hyporheic flow is the mixing of shallow groundwater and surface beneath and alongside a stream bed.

I

Individual Tree Selection - A stand management method in which silviculturists identify individual trees that need to be removed from a stand of trees. In this method, specific types, sizes, or qualities of trees are identified for either removing from the stand or remaining in the stand.

Initial Attack – The fire suppression effort that takes place as soon as possible following a wildland fire report.

Invasive Weed – see Noxious Weeds

K

Known Owl Site - A site that was or is occupied by a pair or resident single as defined by the survey protocol (1990-2012). The specific site location is determined by the unit biologist based on the best and/or most recent information.

L

Ladder Fuels – Fuels that provide vertical continuity between the ground and tree crowns which create a pathway for a surface fire to move into the overstory tree crowns.

Local Road – A forest road that connects terminal facilities with forest collector, forest arterial or public highways. Usually forest local roads are single purpose transportation facilities. (FSH 7709.54, no longer in print)

M

Macrophyte - A macrophyte is an aquatic plant that grows in or near water and is emergent, submergent, or floating. In lakes and streams macrophytes provide cover for fish and substrate for aquatic invertebrates, produce oxygen, and act as food for some fish and wildlife.

Mechanical Thinning - Reducing the number of trees in a stand using a factor which is independent of tree quality. The use of spacing for thinning is one type of mechanical treatment. For example, the closest tree to the points of a 15' by 15' grid would be left, regardless of tree quality.

Microbes - A microbe is a microscopic organism, which may be a single cell or multicellular organism. Microbes are very diverse and include all the bacteria and archaea and almost all the protozoa. They also include some members of the fungi, algae, and animals such as rotifers.

Motor Vehicle Use Map (MVUM) – A map reflecting designated roads, trails and areas on an administrative unit or a Ranger District of the National Forest System. (36 CFR 261.2)

Multi-Cohort – a stand with two or more age classes or cohorts.

N

Nest Patch (or Stand) - 300 meters (radius circle) around a known or predicted owl site, where a spotted owl would be likely to select a nest tree. This is based on habitat usage of spotted owls within the Central Cascades Study Area, located on the Willamette National Forest.

Net Present Value - Difference in Discounted Revenue and Discounted Cost to evaluate if a project would have a positive or negative return on investment.

Noxious Weeds (Invasive species) - Non- native plants listed by the State that generally have either economic or ecosystem impacts, or are poisonous to wildlife and/or livestock. They aggressively invade disturbed areas such as fires, road sides, and construction areas.

O

Obligate Predator - When the word is used as an adjective, obligate means "by necessity" (the antonym is *facultative*) and is used mainly in biology. An obligate predator is an organism whose survival is dependent on consumption of other animals. In the case of aquatic insects these organisms would primarily eat other insects.

Off-Highway Vehicle (OHV) – Describes all those vehicles designed for off-highway use and which are classified as one of four classes of ATV in Oregon. (OHV Guide 2014)

P

Particulate Matter - known as particle pollution or PM, is a microscopic complex mixture of extremely small particles and liquid droplets and contains a “number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mold spores). Fine particles, such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller (EPA website).

Percentile Weather - The weather conditions that can be expected of X% of the days during a fire season. The standard percent’s are Low (0%-15%), Moderate (16%-89%), High (90%-96%) and Extreme (97%+). For example, low percentile weather is the average suite of weather conditions that would occur less than 15% of the time.

Periphyton - Periphyton is a complex mixture of algae, cyanobacteria, heterotrophic microbes, and detritus that is attached to submerged surfaces in most aquatic ecosystems. It serves as an important food source for invertebrates, tadpoles, and some fish.

Phytophagous - Feeding on plant material. This term is typically used when referring to insects.

Predicted Owl Site - An area able to support resident spotted owls (i.e. a potential breeding pair) as determined by the USDI et al. (2008) northern spotted owl occupancy template. This is used for determining effects to spotted owls where survey data are insufficient.

Prescribed Fire Burn Plan - A plan required for each fire application ignited by management. Plans are documents prepared by qualified personnel, approved by the agency administrator, and include criteria for the conditions under which the fire would be conducted (a prescription). Plan content varies among the agencies.

Prescribed Fire - Fire which is planned and used as a tool to meet specific management objectives.

Probably Sale Quantity (PSQ - an estimate of probable harvest levels that could be maintained on a forest annually (Northwest Forest Plan 1994). PSQs represent neither minimum levels that must be met nor maximum levels that cannot be exceeded. Rather, PSQs represent the best assessment of the average annual amount of timber harvest that could occur on a forest without decline, over the long term, if the schedule of harvests and regeneration are followed (Northwest Forest Plan 1994). PSQ can vary and change over time depending on acres available for harvest, expected acre yields and Forest direction.

Primitive Unconfined Recreation- From the Wilderness Act of 1964 and which describes the concept of freely accessed recreational opportunities with minimal interruption to such activity either physically, socially or due to administrative actions implemented by a land management agency such as seasonal closures, group size restrictions, fees, permitting systems or other restrictions.

Probability of Ignition (POI) - The chance that a firebrand would cause an ignition when it lands on receptive fuels.

Problem Fire - Problem fires are wildfires that, because of extreme fire behavior, present a high risk to human safety and loss of forest resources.

R

Rate of Spread (Fire Behavior) - The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

Redd - A fish nest made of gravel, consisting of a depression hydraulically dug by a fish for egg deposition (and then filled) and associated gravel mounds.

Remnant trees - Large to giant-diameter trees within younger-aged stands, that lived through past natural fire disturbances, or were retained after logging. Amounts and distribution of remnant trees within younger stands may be highly variable.

Road – A motor vehicle route over 50 inches wide, unless identified and managed as a trail. (36 CFR 212.1)

Road Decommissioning – Activities that result in the stabilization and restoration of unneeded roads to a more natural state. (36 CFR 212.1)

Rotation - A pre-determined time frame in which an even-aged forest stand would reach maturity and be harvested.

S

Sag Pond - A sag pond is a body of water collected in the lowest parts of a depression formed either near the head scarp of rotational landslides or between two strands of an active strike-slip fault. Hidden Lake sits on a deep seated earthflow and is technically a sag pond.

Salvage - Activity, usually removal or chipping, of tree material killed by a disturbance event such as insects, fire, wind, etc. Where possible, this material is used as some form of forest product of commercial value, such as firewood, pulp, and/or chips.

Seral Stages - Seral stage describes the phase of development of a plant community. Early seral species are those species you would expect to find on a site soon after a major disturbance, like fire. These are species such as pines, Douglas- fir, snowbrush, fireweed, etc. They are generally shade intolerant species.

Late seral are the species that can come in under a fully developed vegetative canopy, such as true firs, prince's pine, lichens, etc.

Silviculture -The theory and practice of directing forest establishment, composition, and growth for the production of forest resources to meet specific management objectives. The word is derived from the Latin word silva, which means "forest" and from cultura, which means "to develop and care for." So, it is the development and caring for the forest.

Silviculturist - One, who plans, assists in and supervises the implementation of silviculture projects. The Silviculturist determines (prescribes) the vegetative treatments necessary to meet the objectives for vegetation on a given site.

Site - A specific location where management activity is considered, planned, or operating.

Site Potential - The specific ability of a site to grow vegetation. It includes the soil, topographic, and climatic conditions that determine the resources available for growing vegetation.

Site Preparation - The removing or rearranging of vegetation or woody debris to meet specific management objectives. Most often it is used to describe the process(es) used to expose mineral soil areas suitable for planting or seeding desirable species of plants.

Slash - Debris resulting from such natural events as wind, fire, or snow breakage; or such human activities as road construction, logging, pruning, thinning, or brush cutting. It includes logs, chunks, bark, branches, stumps, and broken understory trees or brush.

Smoke Sensitive Receptor Areas (SSRA) - Area in which smoke from outside sources is intolerable, for reasons such as heavy population, existing air pollution, or intensive recreation or tourist use.

Soundscape- Geographic region as defined by the audible sounds associated within it.

Spotted Owl Habitat Types – **Suitable habitat** consists of forested stands used by spotted owls for nesting, roosting and foraging. Features that support nesting and roosting typically include a moderate to high canopy closure (60-90 percent); a multi-layered, multi-species canopy with large overstory trees (with dbh of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly. Foraging habitat generally has attributes similar to those of nesting and roosting habitat, but such habitat may not always support successfully nesting pairs (USFWS 2011c, p. A-10).

Dispersal habitat consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities (USFWS 2011c, p. A-10). It consists of conifer and mixed mature conifer-hardwood habitats with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter at breast height (dbh) with open space beneath the canopy to allow spotted owls to fly. Generally, spotted owls use younger stands to move between blocks of suitable habitat, roost, forage and survive until they can establish a nest territory. Juvenile owls also use dispersal habitat to move from natal areas. Dispersal habitat thus includes habitat that would provide some roosting and foraging opportunities during the colonization phase of dispersal, but not at a scale that would support nesting pairs (in which case it would be classified as suitable habitat).

Suitable habitat can also function as dispersal habitat as it supports both territorial and dispersing spotted owls. However, in this document, dispersal habitat generally refers to stands that are 40-79 years old.

Stand - A group of trees of similar canopy structure, species composition, and/or size growing on a continuous area. A stand is distinct from neighboring stands in structure, growing conditions, or management objectives. Stand age for this project is averaged and based on trees of commercial size which is seven inch DBH and greater.

Stand Density Index – SDI – A relative density measure based on the relationship between mean tree size and number of trees per unit area in a stand (Reineke 1933).

Stand Dynamics - The changes in forest stand structure with time, including stand behavior during and after disturbances (Oliver 1996).

Stand Structure - The physical and temporal distribution of trees and other plants in a stand (Oliver 1996).

Stratum – A distinct layer of vegetation within a forest community; canopy layer.

Stream Classes - Class 1 and 2 = perennial fish bearing streams; Class 3 = perennial non-fish bearing streams; Class 4 = intermittent, seasonally flowing streams.

Suppression - All the work of extinguishing or confining a fire beginning with its discovery.

T

"Take" of ESA listed species - Take: to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. Harm is further defined by USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by USFWS as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering.

Thinning - Any cutting or removal of vegetation (trees, brush, etc.) resulting in a reduction of competition for water, light, and/or nutrients between individual plants. Commercial thinning refers to removing material that has an established dollar value on the open market and can be sold with at least a minimal net value sufficient to pay for the thinning activity.

Torching - The burning of the foliage of a single tree or a small group of trees, from the bottom up. Also, single tree torching is one tree and group torching is more than one tree often a patch of multiple trees torching.

Total Maxium Daily Load (TMDL) - TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant.

Treatment - A term used to broadly refer to the management actions made to meet management objectives. It may include thinning, cutting of undesirable trees, prescribed fire, salvage, or any manipulation of the vegetative conditions. In addition, intentionally excluding a portion of a stand from harvest is a management action, or treatment.

Trees per Acre (TPA) – The number of trees on an acre of land.

U

Underburn - Using prescribed fire under the canopy of an existing stand of trees.

Undesirable Species - Any species of plant or animal which is NOT considered to be compatible with meeting management goals and objectives.

Index